

# Science

# Science Faculty

# Vision

To engage, enthuse and inspire students to have a passion for science, a curiosity for the world around them and how it works and to provide all students the ability to progress and be successful regardless of their starting position. It is designed to build upon the foundations of learning from Year 6 on a seven year journey to the end of A Level. Each year builds upon previous learning whilst introducing new ideas and concepts to the students in a logical order. There is an emphasis on students gaining the key knowledge and skills needed to be successful in Science and to be able to relate science to the world around them so they can understand and engage with the issues of the day from the environment to the pandemic and beyond.

# Context

Students living in Market Drayton and the surrounding areas come from a diverse range of backgrounds and with vastly differing aspirations and attitudes towards learning and education. Students have varied levels of exposure to science in Year 6 though most reach Year 7 with a basic knowledge of the fundamental concepts in Biology, Chemistry and Physics.

**Grove School: Curriculum**

# Substantive Knowledge

The curriculum is linked to the AQA specification and follows the requirements of the national curriculum. Every student learns each of the three sciences. This is delivered through a combined thematic approach in Key Stage 3 and as the difficulty and complexity builds through to GCSE, the content is delivered in discrete science subjects. The knowledge builds upon the content acquired in Key Stage 2 and is scaffolded logically throughout a 7-year plan to develop all aspects of science. Care is taken in planning to ensure that students have received a grounding in the key concepts needed before they are built upon with new knowledge. Working scientifically skills as disciplinary knowledge are embedded throughout the curriculum. Interleaving via knowledge quizzes and constant reinforcement of key concepts and ideas is designed to help students to have a good solid base of knowledge. End of unit assessments take place, accompanied by dedicated reflection and improvement time. Intervention materials are provided to support students.

## Supra Curriculum

Students have access to online learning platforms – ezy science (<https://www.ezyeducation.co.uk/ezy science.html>) and Seneca learning as well as the Kerboodle online text book (<https://www.kerboodle.com/>). Students use the Science news website (<https://www.sciencenews.org/>) to help to develop scientific literacy and to encourage an interest in science issues outside of the curriculum.

# Key Stage 3

# Science

## Year 7

Students begin their secondary school journey in Science by building upon the Key Stage 2 curriculum through themed units. Themed units will consist of the different scientific disciplines of Biology, Physics, Chemistry and including the development of 'Working Scientifically' skills. The scientific topics that will be covered within Year 7 are: Cells, tissues, organs and systems; Sexual reproduction; Muscles and bones; Ecosystems; Mixtures and separation; Acids and alkalis; Particle model; Atoms, elements and compounds; Energy; Current and electricity; Forces and sound. Skills that are covered include 'Maths in Science', and 'Working Scientifically' for the development of practical skills.

## Year 8

Students will build upon our Key Stage 3 Year 7 curriculum through themed units. Themed units will consist of the different scientific disciplines of Biology, Physics, Chemistry and including the development of 'Working Scientifically' skills. Scientific topics that will be covered within Year 8 are: Digestive system; Role of enzymes in the body – specifically the digestive system; Organs and organ systems; Immune response and immune system; Aseptic technique. Students will continue with learning skills for 'Maths in Science' and the development of 'Working Scientifically' skills.

## Year 9

Students will review the key pillars of science which underpin the GCSE learning to follow. In Biology, students will examine basic cell structure, plants and animals and adaptations. In Chemistry, students will look at basic atomic structure, formulae of atoms and reaction with acids and alkalis. They will look at different materials and their properties. In Physics students will look at the basics of energy, electricity and formulae and constructing graphs. Students will continue to develop 'Working Scientifically' skills in practical activities and investigations.

## The Big Picture: Present a clear outline of the year in this subject. Subject: Science Year Group: 7

*Six themed units addressing a combination of disciplines Biology, Chemistry and Physics within each themed unit.*

*Skills involving application, Maths in Science and Working Scientifically skills will be addressed alongside the subject content, where appropriate.*

**Intent:** List the units to be covered:- Unit 1: Not all scientists wear white coats; Unit 2- 999 What's your emergency?; Unit 3- Titanic; Unit 4- Shipwrecked; Unit 5- Earth in Danger;

Unit 6- Leaving Earth

List the overall skills and knowledge to be covered:- Cells, tissues, organs and systems; sexual reproduction; muscles and bones; ecosystems; mixtures and separation; acids and alkalis; particle model; atoms, elements and compounds; Energy; Current electricity; forces and sound. Skills: Maths in Science and Working Scientifically for development of practical skills.

Clearly outline how this year of study will build on prior learning during the previous academic year : Working Scientifically-building on being able to conduct experiments, analysing results by drawing simple conclusion

Biology topics involving plant parts and their life cycle; Nutrition and Health; Skeletal system; Habitats and interdependence-introduction of pyramids of numbers/biomass and adaptations of animals and plants to their environment;

Light builds on the idea of light and dark and shadows by introducing the visible light spectrum, refraction, dispersion and reflection; Forces and magnets building from poles and attraction to magnetic fields and weight on other planets; states of matter builds by introducing the particle and changes of state; Electricity builds on by classifying simple circuits, drawing circuit diagrams

## Implementation

How will the units within this year of study be organised/structured?

*Six themed units addressing a combination of disciplines Biology, Chemistry and Physics within each themed unit.*

Unit 1: Not all scientists wear white coats; Unit 2- 999 What's your emergency?; Unit 3- Titanic; Unit 4- Shipwrecked; Unit 5- Earth in Danger; Unit 6- Leaving Earth

How will you promote SMSC through this year of study?

Unit 1: Jake's story-Heartburn; Unit 2: Condition of asthma and its effects on sufferers; Unit 3: Story of Titanic and lifeboats

Unit 4; Survival needs-making shelters; Unit 5; Use of fossil fuels, global warming and alternative sources of energy;

Unit 6; How was the Earth, atmosphere and solar system created? Journey to Mars-opportunity for spiritual discussions versus science and human limitations.

How will you develop and build thinking skills and independent learner behaviours?

Group work; research opportunities; problem solving approach through competitions

*What style of home learning will you set and how will this build on or prepare for class work? Is it purposeful?*

In what ways are you developing interleaving/revision skills?

Various ways of revision are being encouraged to be developed as each unit progresses

Interleaving- Assessments, spellings, themed series of lessons with overarching story, whilst linking scientific disciplines in the unit to enhance recall and retention

Where are the WOW moments and how will you celebrate achievement?

Achievement: school reward policy, postcards, SIMS INTOUCH, ATL 1's, Faculty rewards for end of year.

WOW- Competition through design, experimental exploration, application to daily and world events

How are literacy and numeracy skills to be developed and extended? Scientific literacy, experimental write ups, spellings, presentations. Numeracy involving mathematical equations and the rearrangement of, standard index units, measurement conversion between units

### Consider your assessment Markers

Identify where the following will take place;

**Key assessments- EOU Tests**

**Low stakes testing: Application,**

**data, skills tests in each unit**

**Deep marking points: Tests**

**Home learning: Tasks are based on**

**Working Scientifically, improving**

**literacy, data, application**

**Examinations-EOU**

**Conferencing/DIRT- lesson after**

**EOUtest and low stakes testing**

**points.**

**Moderation-Termly of EOU**

**Tests/Skills tests**

Autumn Term  
Unit 1, Unit 2

Spring Term  
Unit 3, 4

Summer Term  
Unit 5, Unit 6

## Impact

What is it that you want students to know/be able to do by the end of this year of study? Develop scientific literacy and communication skills, by developing scientific techniques.

Developing working scientifically skills including developing scientific thinking; Experimental skills and strategies; Analysis and Evaluation. Developing maths skills in science including arithmetic and numerical computation; data handling; algebra; graphical skills; Awareness of health and safety within the laboratory environment and be able to name and use scientific apparatus in an appropriate manner.

What are the next steps? How can the knowledge/skills from this year be extended next year?

Through the next series of themed units, Masterchef, Fireworks, Top Gear, Materials and Recycling, Down the Farm and Going for Gold covering biology, physics and chemistry disciplines, continue to develop and apply developing working scientifically skills, through various topics within these themes. These include developing scientific thinking; Experimental skills and strategies; Analysis and Evaluation.

Continuation of developing maths skills in science including arithmetic and numerical computation; data handling; algebra; graphical skills. Continue developing health and safety within the laboratory environment and be able to name and use scientific apparatus in an appropriate manner. Possible introduction to extend learners to using Hazcards.

## The Big Picture: Present a clear outline of the year in this subject.

Subject: Science Year Group: 8

Six themed units addressing a combination of disciplines Biology, Chemistry and Physics within each themed unit.

Skills involving application, Maths in Science and Working Scientifically skills will be addressed alongside the subject content, where appropriate.

**Intent:** List the units to be covered:- Unit 1: Masterchef; Unit 2- Fireworks; Unit 3- Down on the Farm; Unit 4- Materials & Recycling; Unit 5- Going for Gold; Unit 6- Top Gear

List the overall skills and knowledge to be covered:- Digestive system; Role of enzymes in the body-specificallthe digestive system; Organs and organ systems; Immune response and immune system; Aseptic technique;

Writing of a risk assessment; Calculations involving equations; rearranging an equation;

Clearly outline how this year of study will build on prior learning during the previous academic year: Working Scientifically-building on being able to conduct experiments, analysing results by drawing simple conclusion and improving planning phases of investigations

Biology topics involving plant biology; Nutrition and Health; Human Biology- digestive and immune systems; Habitats and interdependence-introduction of pyramids of numbers/biomass and adaptations of animals and plants to their environment; Physics: Light builds on the idea of light and dark and shadows by introducing the visible light spectrum, refraction dispersion and reflection; Forces and magnets building from poles and attraction to magnetic fields and weight on other planets; states of matter builds by introducing the Periodic Table and the structure of an atom.

## Implementation

How will the units within this year of study be organised/structured?

Six themed units addressing a combination of disciplines Biology, Chemistry and Physics within each themed unit: Unit 1:

Masterchef; Unit 2- Fireworks; Unit 3- Down on the Farm; Unit 4- Materials & Recycling; Unit 5- Going for Gold; Unit 6- Top Gear

How will you promote SMSC through this year of study?

Unit 1: Teamworking. Shunning people with different/unknown diseases? ; Unit 2: Symbolism of November 5<sup>th</sup> & why we had

fireworks; Unit 3: Genetic engineering-plants & animals-should we? Unit 4; Wearable Technology; Unit 5; Ethics of Perform

Enhancing drugs & sport; Unit 6; Driving whilst being under the influence

How will you develop and build thinking skills and independent learner behaviours?

Group work; research opportunities; problem solving approach through competitions; Dissections; Investigations

What style of home learning will you set and how will this build on or prepare for class work? Is it purposeful? Seneca; Skills assessments

In what ways are you developing interleaving/revision skills?

Various ways of revision are being encouraged to be developed as each unit progresses

Interleaving- Assessments, spellings, themed series of lessons with overarching story, whilst linking scientific disciplines in the unit to enhance recall and retention

Where are the WOW moments and how will you celebrate achievement?

Achievement: school reward policy, postcards, SIMS INTOUCH, ATL 1's, Faculty rewards for end of year.

WOW- Competition through design, experimental exploration, application to daily and world events

How are literacy and numeracy skills to be developed and extended? Scientific literacy, experimental write ups, spellings, presentations. Numeracy involving mathematical equations and the rearrangement of, standard index units, measurement conversion between units

### Consider your assessment Markers

Identify where the following will take place;

**Key assessments- EOU Tests**  
**Low stakes testing: Application, data, skills tests in each unit**  
**Deep marking points: Tests**  
**Home learning: Tasks are based on Working Scientifically, improving literacy, data, application**  
**Examinations-EOU**  
**Conferencing/DIRT- lesson after EOUp test and low stakes testing points.**  
**Moderation-Termly of EOU Tests/Skills tests**

Autumn Term  
Unit 1, Unit 2

Spring Term  
Unit 3, 4

Summer Term  
Unit 5, Unit 6

## Impact

What is it that you want students to know/be able to do by the end of this year of study? Develop scientific literacy and communication skills, by developing scientific techniques.

Developing working scientifically skills including developing scientific thinking; Experimental skills and strategies; Analysis and Evaluation. Developing maths skills in science including arithmetic and numerical computation; data handling; algebra; graphical skills; Awareness of health and safety within the laboratory environment and be able to name and use scientific apparatus in an appropriate manner.

What are the next steps? How can the knowledge/skills from this year be extended next year?

Transitioning and building upon KS3 into GCSE. These include developing scientific thinking; Experimental skills and strategies; Analysis and Evaluation. Continuation of developing maths skills in science including arithmetic and numerical computation; data handling; algebra; graphical skills. Continue developing health and safety within the laboratory environment and be able to name and use scientific apparatus in an appropriate manner. Possible introduction to extend learners to using Hazcards.

## The Big Picture:

*This year will build on the foundations of science knowledge and working scientifically skills gained in KS3. All students will get a secure grounding in the key concepts of Biology, Chemistry and Physics which underpin the future learning in Years 10 and 11 and are crucial to build the more complex GCSE concepts around.*

Subject: Science Year Group: 9

### Intent

Topic	Skills	Knowledge	Prior knowledge	Future extensions
Catch up	All the skills identified as requiring improvement form the end of year tests and revisiting key skills which students are required to know in-order to build GCSE skills.	All the knowledge identified as requiring improvement form the end of year tests and revisiting key knowledge which students are required to know in-order to build GCSE skills.	KS2 science content	KS4 content
Scientific Enquiry	Working scientific skills taught alongside scientific enquiries, these skills are required for the GCSE course.	Knowledge from these topics are required and form a good basis for starting the GCSE course. The knowledge is delivered as part of wider scientific enquiries	KS3 science content	KS4 content
Cell Biology and Organisation	Cell identification, Use of microscopes, calculating magnification.	Cells and their structures, Cell specialisation, Osmosis and diffusion, Stem cells, Blood, The heart	Structure of animal and plant cells - Y7/8	Therapeutic cloning and DNA - Y11
Atomic Structure and the periodic table	Be able to draw an atom, describing the history of the atom.	Structure of the atom, Isotopes, trends and patterns in the periodic table - groups 1 and 7.	Structure of the atom -Y7/8	Predicting reactions - Y10
Chemical analysis	RP - Chromatography and calculating R <sub>f</sub> value.	How to define and identify pure and impure substances. Gas tests.	Separating mixtures - chromatography and distillation.	Analysis of unknown chemicals
Chemistry of the atmosphere	Explaining the origins of our atmosphere	Evolution of our atmosphere, effects of fossil fuels, Greenhouse effect	Energy resources – yr 7; Fossil fuels Yr 7	Ecology- Yr 11, Organic Chemistry
Energy	Predict energy transfers, compare power stations and manipulate complex equations.	Different types of energy and power stations including their advantages and disadvantages. SCH calculations.	Generating electricity - Y7 Energy - Y7	Latent heat - Y19 Forces - Y11
Particles and Atomic structure.	. RP - calculating density.	Density equation. Kinetic theory, latent heat and specific latent heat. Brownian motion.	Changes of state - Y8	Gas laws, pressure at A-level and GCSE

### Implementation

Unit	Term	SMSC	Homework/Revision
Catch up	Autumn	Working as part of a group or team, sometimes to create their own working teams	<ul style="list-style-type: none"> <li>✓ <i>Ezscience homework set weekly on average.</i></li> <li>✓ <i>Exam questions are set fortnightly</i></li> <li>✓ <i>Deep marking of LOR questions</i></li> <li>✓ <i>Research tasks / projects</i></li> <li>✓ <i>Keyword and definition tests/quizzes</i></li> <li>✓ <i>Completion of DIRT process following an assessment.</i></li> <li>✓ <i>Revision activities to consolidate learning after each unit.</i></li> </ul>
Scientific Enquiry	Autumn	Sharing of views and opinions with others and resolving any differences maturely.	
		Showing respect for people, living things, property and the environment	
B1 - Cell Biology	Spring	Collaborating positively to carry out experiments and required practical's.	
C1 - Atomic Structure	Spring	Completing PLC and taking responsibility for closing gaps in their own knowledge.	
P1 Energy	Spring/ Summer	Debating the best power stations to use by balancing economic and environmental concerns.	
P3 – Particle model of Matter	Spring/ Summer	Assessing the impact of burning fossil fuels on the environment.	
C8 – Chemical Analysis	Summer		<i>Literacy:- Use of key words and emphasis of understanding key definitions (including key WS terms) each lesson</i>
C9 – Chemistry of the atmosphere,	Summer		<i>Numeracy:- Interpretation of graphs and data in tables. Calculations using formulae and rearranging 3 and 4 term equations. Significant figures applied correctly and prefixes k (1000) and m(0.001) known.</i>

#### Autumn Term

Assessment based on catch up test unit  
Assessment based on working scientifically knowledge  
End of term assessment.

#### Spring Term

End of unit tests and long answer exam questions. Each topic has multiple opportunities for work to be deep marked

#### Summer Term

End of unit tests and long answer exam questions.  
  
Each topic has multiple opportunities for work to be deep marked

### Impact

Biology	Chemistry	Physics
<p>How to calculate magnification.</p> <p>Identify complex features in cells and their functions and to distinguish the key features and behaviours of Eukaryotic and Prokaryotic cells.</p> <p>The difference between diffusion and osmosis and the mechanism for each</p> <p>The role of active transport with living organisms.</p> <p>The role of the blood within the body and its composition.</p> <p>The structure of the heart and the tissues within it</p>	<p>Definitions of elements, mixtures and compounds and separation techniques.</p> <p>Balancing chemical equations.</p> <p>The structure of the atom, mass number, atomic number, isotopes, electron shells and electronic structure.</p> <p>The history of the periodic table, properties of group 1 and group 7 elements and trends within the period for each group.</p> <p>.Knowing the gas tests. How to perform paper chromatography. The composition of the early atmosphere compared the current one</p>	<p>Types of energy stores and how devices convert form one to another.</p> <p>How to calculate kinetic energy, gravitational potential energy, elastic energy, power and the efficiency of devices. What happens to wasted energy.</p> <p>Insulation, payback time and how to calculated specific heat capacity.</p> <p>How 11 types of power station work and their advantages and disadvantages compared to others. Economic and environmental issues with power stations.</p> <p>Calculating density and measuring the density of regular and irregular objects.</p> <p>Describing kinetic theory and changes of state. Calculating specific latent heat and specific heat capacity</p>



# Key Stage 4

# Trilogy Science

## Year 9

All students will begin their journey of discovery into GCSE by studying the fundamental areas of Biology, Chemistry and Physics. They will gain a greater understanding of the working of cells, the nature of atoms and the periodic table and energy changes. They will learn how different power stations work and address some of the issues around them. Students will carry out required practicals and enhance their 'Working Scientifically' skills.

## Year 10

Students continue their journey into Biology by looking at systems and organs in the body, examining how organs work together and how reactions are affected by catalysts. Students will look at diseases, their causes, effects and treatments and the science behind the development of those treatments. Students will see how lifestyle can affect health. They will look at the processes of photosynthesis and respiration.

In Chemistry, students will look at how bonding occurs and how it links to the properties of the compounds created. They will learn about the mole and chemical reactions including salts, electrolysis and exothermic reactions. Students will link catalysts to the rate of chemical reactions.

In Physics, students will learn about electrical circuits and domestic electricity. They will look at kinetic theory, linking the arrangement and behaviour of particles to the properties of materials and examine the energy changes within changes of state. They will then look at nuclear radiation, considering its types, properties, benefits, uses and potential hazards. Students will extend their understanding of forces and Newton's Laws of Motion, including scalar and vector quantities.

Students will continue to develop their 'Working Scientifically' skills through experiments and investigations.

## Year 11

Students continue their journey into Biology by looking at diabetes, its causes and treatments. They look at natural selection, DNA, genetics and genetic engineering and examine the issues associated with it. Students will look at adaptations of animals and plants to see how they are designed to live in their specific ecosystems. They then look at ecosystems, how they function and the impact upon them by human activity including global warming and the greenhouse effect.

In Chemistry, students look at rates of reaction, alkanes, alkenes and crude oil. They examine the development of the earth's atmosphere and how the burning of fossil fuels is causing change including global warming and the greenhouse effect. Students then look at issues involving sustainability maintaining resources and recycling.

In Physics, students learn more about forces including acceleration, terminal velocity, speed and acceleration. Students learn to calculate values from distance-time and velocity-time graphs. Students learn the different types of waves and the uses and properties of each wave in the electromagnetic spectrum. They look at magnetic fields, electromagnets and the motor effect.

Students will continue to develop their 'Working Scientifically' skills through experiments and investigations, becoming increasingly adept and independent when planning, performing and assessing experiments.

# Trilogy Biology Key Stage 4 Overview

What is my Learning Journey for Year 9 to 11?

**Content** – Interdependence, adaptation, ecosystems, recycling materials, biodiversity and human impacts.

**Bigger Picture Focus** – To consider the impacts our actions have on other organisms and ways we can make positive changes.



**Content** – Homeostasis, the nervous system, hormonal coordination, blood glucose control, menstrual cycle, infertility and contraception

**Bigger Picture Focus** – To understand how we can manipulate the hormonal system to prevent pregnancy or help people have children who normally would not be able to.

## Exams:

-6 x 75 minute papers – 2 for biology, 2 for chemistry, 2 for physics  
There is no coursework element.

## Assessments:

-End of unit tests  
--6 mark question practice for each unit

## #realworldready

- Appreciate how scientific understanding can lead to the development of cures and treatments for diseases to save lives
- Understand how to minimise our impact on the organisms in the world around us
- Consider whether just because science allows us to manipulate organisms, should we be allowed to?
- Understand the importance of science to a wide variety of careers.

## Useful websites and support

-GCSE bitesize  
-Kerboodle  
-Oak Academy  
-Seneca  
-Ezyscience

## Key Skills:

- Recall and retention of scientific facts
- Analysing and interpreting data
- Evaluating information

## Home Learning

-Weekly interleaving quizzes and homework  
Other tasks may include:  
-6 mark question practice for each unit  
-Past paper practice  
-Flipped learning tasks

B7 Ecology

B6 Inheritance, variation and evolution

B5 Homeostasis and response

B4 Bioenergetics

B2 Organisation (II)

YEAR 11

B3 Infection and response

**Content** – Pathogens and the diseases they cause, human defences and the immune response, vaccination, antibiotics, drug discovery and development.

**Bigger Picture Focus** – To examine the different types of diseases and ways we can prevent their spread and treat them to save lives around the world.

**Content** – Levels of organisation, food, digestion, enzymes, heart and blood, cardiovascular disease, cancer, plant organs and plant transport

**Bigger Picture Focus** – To link how understanding how our bodies work enable scientists to develop a variety of ways of treating diseases.

**Content** – Cells, specialised cells, microscopy, cell division, stem cells and transport in cells.

**Bigger Picture Focus** – To understand how knowledge of the fundamental building blocks that make up living organisms and can lead to the development of therapies to cure diseases.

YEAR 10

B2 Organisation (I) B1 Cells

YEAR 9

Scan this QR code to take you to the specification we study.



# Recommended reading for KS4 Science

Title	Author	Year	Science Topic
The Senses	Matteo Farinella	10	Cells, Working Scientifically, Skeleton, Light and sound,
Never home alone	Rob Dunn	10	Microbes and disease, Working Scientifically, Living things and their habitats, Human Biology, Cells
Exploring the Elements	Isabel thomas	10	Working Scientifically, Elements, Chemistry, Atomic Structure
What If?	Randall Munroe	11	Working scientifically, Cells and Organisation, Health and drugs, Ecosystems, Genetics and Evolution, Particles, Atoms, Elements and compounds, The Periodic Table, Materials, Earth and the atmosphere, Energy, Motion and Forces, Waves, Electricity, Space Physics, Atomic Structure.
Lab Girl	Hope Jahren	11	Plants, Botany, Working Scientifically, Photosynthesis, Ecology, Living things and their habitats
Question Everything - 132 Science questions	Mick O'Hare	10	All Biology, Chemistry and Physics
Does anything eat wasps and 101 other questions	Mick O'Hare	10	All Biology, Chemistry and Physics
The Body - A guide for occupants	Bill Bryson	10	Biology

# Trilogy Science Chemistry Key Stage 4 Overview

What is my Learning Journey for Years 9 to 11?

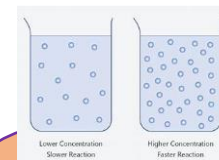


**Content – Recycling, Water, Reducing use of resources, Finite and renewable resources**  
Big picture focus – how recycling can extend the use of resources and positively impact the environment.



**Content – Crude oil, Hydrocarbons and alkanes.**  
Big picture focus – Uses of crude oil and the impact on the environment.

**Content – Affect of catalyst, concentration, temperature on rate of reaction. Reversible reactions**  
Big picture focus – the role of catalysts in everyday reactions.



**C10 Using Resources**

**C7 Organic Chem**

**C6 Rates**

YEAR  
**11**

## Assessments:

- End of unit tests
- 6 mark question practice for each unit

## #realworldready

- Understanding about the elements that make up the world around us, how we can study and separate each of these elements and compounds.
- Looking at the history behind different scientific theories and understanding how these change over time.
- Topics look at how we can best look after the world around us and live more sustainably.
- Understand the importance of science to a wide variety of careers.

## Useful websites and support

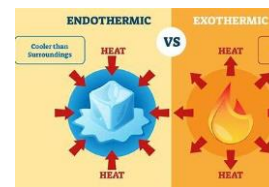
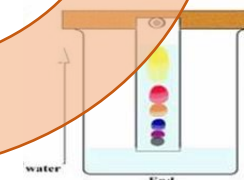
- GCSE bitesize
- Kerboodle
- Oak Academy
- Seneca
- Ezscience

## Key Skills:

- Recall and retention of scientific facts
- Analysing and interpreting data
- Evaluating information

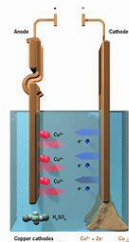
Home Learning

- Weekly interleaving quizzes and homework
- Other tasks may include:
- 6 mark question practice for each unit
- Past paper practice
- Flipped learning tasks

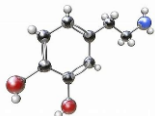


**Content – Endothermic and exothermic reactions, Reaction profiles**  
Big picture focus – everyday uses of exothermic and endothermic reactions

**Content – Reactions of metals, Acids, alkalis, salts, Electrolysis**  
Big picture focus – Use of electrolysis in extracting useful products and the financial and environmental impacts of doing so.

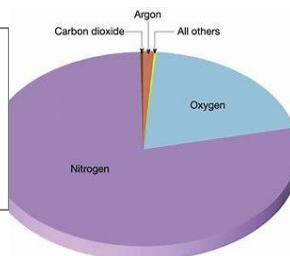


**Content – Calculating formula mass, Conservation of mass, Calculating concentration, Balancing equations**  
Big picture focus – formulae and calculations



**C4 Chem Changes**

**C5 Energy Changes**



**Content – Developing the atmosphere, Polluting the atmosphere**  
Big picture focus – climate change, its causes and the likely impact on the world.

**Content – Three states of matter, Ionic bonding, Covalent bonding, Metals and alloys.**  
Big picture focus – linking properties to bonding

**Content – Chromatography, Rf values, Pure substances and mixtures.**  
Big picture focus – use of analysis techniques.

**Content – Periodic table, element, compound, atomic structure, groups of the periodic table.**  
Big picture focus – Uses of the periodic table in chemistry.



**C1 Atomic Structure**

**C9 Atmosphere**

**C8 Chem Analysis**

**C2 Bonding**

**C3 Quantitative**

YEAR  
**10**

YEAR  
**9**

Scan this QR code to take you to the specification we study.



# Recommended reading for KS4 Science

Title	Author	Year	Science Topic
Atomic Women	Roseanne Montillo	10	Working Scientifically, Atomic Structure, Energy
Never home alone	Rob Dunn	10	Microbes and disease, Working Scientifically, Living things and their habitats, Human Biology, Cells
Exploring the Elements	Isabel thomas	10	Working Scientifically, Elements, Chemistry, Atomic Structure
What If?	Randall Munroe	11	Working scientifically, Cells and Organisation, Health and drugs, Ecosystems, Genetics and Evolution, Particles, Atoms, Elements and compounds, The Periodic Table, Materials, Earth and the atmosphere, Energy, Motion and Forces, Waves, Electricity, Space Physics, Atomic Structure.
Question Everything - 132 Science questions	Mick O'Hare	10	All Biology, Chemistry and Physics
Does anything eat wasps and 101 other questions	Mick O'Hare	10	All Biology, Chemistry and Physics



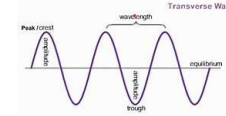
# Trilogy Science Physics Key Stage 4 Overview

*What is my Learning Journey for Years 9 to 11?*



**Content – Permanent and induced magnets, magnetic field, Electromagnets. The motor effect, Big picture focus – understanding what role electromagnets and motors play in our lives.**

**Content – Transverse and longitudinal waves Labeling a wave, calculating wave speed, refraction, electromagnetic waves uses and dangers. Big picture focus – Seeing how we use different types of e-m waves every day.**



**P7 Magnets**

**P6 Waves**

**Forces**

**YEAR 11**

## #realworldready

- Appreciate how our Earth is part of a wider system and the study into this.
- Understanding how and why objects act in the way that they do
- Understanding the theories that Scientists have developed over time and how/why these change
- Looking at the use of electricity in everyday lives and how we can develop our usage to be more sustainable.
- Understand the importance of science to a wide variety of careers.

## Useful websites and support

- GCSE bitesize
- Kerboodle
- Oak Academy
- Seneca
- Ezyscience

## Key Skills:

- Recall and retention of scientific facts
- Analysing and interpreting data
- Evaluating information

**Home Learning**

- Weekly interleaving quizzes and homework
- Other tasks may include:
- 6 mark question practice for each unit
- Past paper practice
- Flipped learning tasks

**Content – Static electricity. Current, Voltage, Resistance. Circuits symbols and how to build circuits. Series and parallel circuits, a.c and d.c, mains electricity. Power, National grid. Big picture focus – to understand how a.c electricity differs from d.c and what safety features are in place to protect us from shocks.**

**Content – Atomic model, Discovery of the atomic model, Isotopes, Ions, Radioactive decay, Uses and dangers of radiation. Big picture focus – How experiments led to the atomic model and how theories will change over time. How radiation is able to harm us and how we can protect against it.**



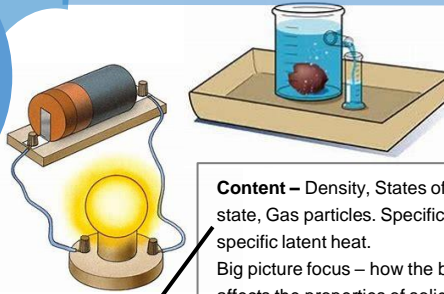
**Content – Speed, Acceleration, Distance-Time graphs, Velocity-Time graphs, Contact and non-contact forces, Gravity, Hooke's Law, Newton's laws, Scalar and Vectors. Big picture focus – how streamlining and design can reduce air resistance and improve efficiency and top speed of a vehicle.**

**P2 Electricity**

**P4 Atomic Structure**

**P5 Forces**

**YEAR 10**



**Content – Density, States of matter, Changes of state, Gas particles. Specific heat capacity and specific latent heat. Big picture focus – how the behaviour of particles affects the properties of solids, liquids and gases**

**Content – Energy stores, Energy calculations, Work, Power, Renewable and Non-Renewable. Energy transfers. Power stations and the national grid. Big picture focus – how different power stations affect the environment and how to generate carbon free electricity**



**Particle Model**

**P1 Energy**

**YEAR 9**

Scan this QR code to take you to the specification we study.





# Recommended reading for KS4 Science

Title	Author	Year	Science Topic
The Senses	Matteo Farinella	10	Cells, Working Scientifically, Skeleton, Light and sound,
Atomic Women	Roseanne Montillo	10	Working Scientifically, Atomic Structure, Energy
Exploring the Elements	Isabel thomas	10	Working Scientifically, Elements, Chemistry, Atomic Structure
What If?	Randall Munroe	11	Working scientifically, Cells and Organisation, Health and drugs, Ecosystems, Genetics and Evolution, Particles, Atoms, Elements and compounds, The Periodic Table, Materials, Earth and the atmosphere, Energy, Motion and Forces, Waves, Electricity, Space Physics, Atomic Structure.
Lab Girl	Hope Jahren	11	Plants, Botany, Working Scientifically, Photosynthesis, Ecology, Living things and their habitats
The Mysteries of the Universe	Will Gater	10 seps	Space, Physics, Astronomy,
Question Everything - 132 Science questions	Mick O'Hare	10	All Biology, Chemistry and Physics
Does anything eat wasps and 101 other questions	Mick O'Hare	10	All Biology, Chemistry and Physics
The Radium Girls	Kate Moore	10	Radiation

# Key Stage 4

# Triple Science

# Biology

## Year 9

All students will begin their journey of discovery into GCSE by studying the fundamental areas of Biology. They will gain a greater understanding of the workings of cells, movement of substance and the uses and ethical quandaries of stem cells. The students develop an understanding of the body, its digestive system, circulatory system and respiratory system, examining how organs work together and how reactions are affected by catalysts. Students delve into plants and organ systems. Students conclude the year by discovering how infectious disease spreads and how to prevent this. Incorporated is learning how to live a healthy lifestyle. Students discover the world of monoclonal antibodies. Students will carry out required practical's and enhance their 'Working Scientifically' skills.

## Year 10

Students continue their journey into Biology by looking at how disease can be treated. Specifically delving into plant disease. Student also develop the skill to investigate bacterial growth. They discover how our own body fight back against pathogens and why we may need additional help. Students understand how vaccines are made and consider the moral, legal and scientific drug discovery process. The students then look at other diseases such as cancer, diabetes and heart disease and how we can both treat, prevent and potentially cure illness. Moving on to the topic of the nervous system, students develop a knowledge of how nerves work to control our body. The brain and eye functions and disease play a key part to learning. Students acquire knowledge in how the body hormones can cause issues when not regulated, but the importance of hormones in homeostatic mechanisms. Discovering diabetes, plant hormones, osmoregulation and thermoregulation rounds up the year.

Students will continue to develop their 'Working Scientifically' skills through experiments and investigations throughout the year, becoming more adept and independent when planning, performing and assessing experiments.

## Year 11

Students continue their journey into Biology by looking at gene expression from DNA. Students begin to develop their understanding of reproduction and the importance of inheritance to species survival. Studies into inherited disorders such as Polydactyl and Cystic Fibrosis concludes in understanding XX versus XY. Students acknowledge every organism has variation and link their previous learning to how animals evolved. Students also learn how we can choose to breed a certain gene through selective breeding, genetic engineering and cloning. Students recognise the importance of proof of theories and why questioning is key to Biology.

A trip into why extinction occurs and what the future holds for antibiotic resistance takes place. We look at how to group organisms and take a dive into the world of ecology. Students will look at adaptations of animals and plants to see how they are designed to live in their specific ecosystems. They then look at ecosystems, how they function and the impact upon them by human activity including global warming and the greenhouse effect. This element of the course culminates in describing and explaining how food industries are designed to work in the modern day.

Students will continue to develop their 'Working Scientifically' skills through experiments and investigations throughout the year, becoming adept and independent when planning, performing and assessing experiments, culminating in the end of year exam process.

# Triple Science Biology Key Stage 4 Overview

*What is my Learning Journey for Years 9 to 11?*

**Content** – Interdependence, adaptation, ecosystems, recycling materials, biodiversity and human impacts.

**Bigger Picture Focus** – To consider the impacts our actions have on other organisms and ways we can make positive changes.



**Content** – Homeostasis, the nervous system, hormonal coordination, blood glucose control, menstrual cycle, infertility and contraception

**Bigger Picture Focus** – To understand how we can manipulate the hormonal system to prevent pregnancy or help people have children who normally would not be able to.

## Exams:

-2 x 1 hour 45 minute papers  
There is no coursework element.

## Assessments:

-End of unit tests  
--6 mark question practice for each unit

## #realworldready

- Appreciate how scientific understanding can lead to the development of cures and treatments for diseases to save lives
- Understand how to minimise our impact on the organisms in the world around us
- Consider whether just because science allows us to manipulate organisms, should we be allowed to?
- Understand the importance of science to a wide variety of careers.

## Useful websites and support

-GCSE bitesize  
-Kerboodle  
-Oak Academy  
-Seneca  
-Ezyscience

## Key Skills:

- Recall and retention of scientific facts
- Analysing and interpreting data
- Evaluating information

## Home Learning

-Weekly interleaving quizzes and homework  
Other tasks may include:  
-6 mark question practice for each unit  
-Past paper practice  
-Flipped learning tasks

**B7 Ecology**

**B6 Inheritance, variation and evolution**

**B5 Homeostasis and response**

**Content** – Photosynthesis, rates of photosynthesis, aerobic and anaerobic respiration, responses to exercise and metabolism.

**Bigger Picture Focus** – To understand the role of plants in our ecosystems and how, without them, we would not be here.



**Content** – Reproduction, DNA, inheritance, inherited disorders, variation, evolution, selective breeding, genetic engineering, fossils, extinction and classification

**Bigger Picture Focus** – To understand how we can use our knowledge of genetics to enhance crops, develop more valuable livestock as well as appreciating how our actions have caused the loss of species



YEAR

**11**

**B4 Bioenergetics**

**B2 Organisation (II)**

**Content** – Pathogens and the diseases they cause, human defences and the immune response, vaccination, antibiotics, drug discovery and development.

**Bigger Picture Focus** – To examine the different types of diseases and ways we can prevent their spread and treat them to save lives around the world.

**Content** – Levels of organisation, food, digestion, enzymes, heart and blood, cardiovascular disease, cancer, plant organs and plant transport

**Bigger Picture Focus** – To link how understanding how our bodies work enable scientists to develop a variety of ways of treating diseases.

**Content** – Cells, specialised cells, microscopy, cell division, stem cells and transport in cells.

**Bigger Picture Focus** – To understand how knowledge of the fundamental building blocks that make up living organisms can lead to the development of therapies to cure diseases.

YEAR

**9**

**B3 Infection and response**

YEAR

**10**

**B2 Organisation (I)**

**B1 Cells**



Scan this QR code to take you to the specification we study.



# Recommended reading for KS4 Science

Title	Author	Year	Science Topic
The Senses	Matteo Farinella	10	Cells, Working Scientifically, Skeleton, Light and sound,
Never home alone	Rob Dunn	10	Microbes and disease, Working Scientifically, Living things and their habitats, Human Biology, Cells
Exploring the Elements	Isabel thomas	10	Working Scientifically, Elements, Chemistry, Atomic Structure
What If?	Randall Munroe	11	Working scientifically, Cells and Organisation, Health and drugs, Ecosystems, Genetics and Evolution, Particles, Atoms, Elements and compounds, The Periodic Table, Materials, Earth and the atmosphere, Energy, Motion and Forces, Waves, Electricity, Space Physics, Atomic Structure.
Lab Girl	Hope Jahren	11	Plants, Botany, Working Scientifically, Photosynthesis, Ecology, Living things and their habitats
Question Everything - 132 Science questions	Mick O'Hare	10	All Biology, Chemistry and Physics
Does anything eat wasps and 101 other questions	Mick O'Hare	10	All Biology, Chemistry and Physics
The Body - A guide for occupants	Bill Bryson	10	Biology

# Key Stage 4

# Triple Science

# Chemistry

## Year 9

All students will begin their journey of discovery in GCSE by studying the fundamental areas of Chemistry. They will gain a greater understanding of the working of the nature of atoms and gain an understanding of the history and trends of the periodic table. Students will learn how to balance equations and to separate mixtures of elements and compounds. The use of 'Maths in Science' is introduced through instances such as atomic structure, molecular formulae and utilising standard form. Students will carry out required practicals, which are a practical focus of the GCSE qualification and develop their 'Working Scientifically' skills.

## Year 10

Students continue their journey in Chemistry. Students will formulate an understanding of structure and bonding within substances and how bonding occurs; there is also a focus upon how this links to the properties of the compounds created. Maths in Science skills are developed further, by focussing upon chemical calculations together with 'Working Scientifically' skills.

Next, students progress by developing an understanding of surrounding chemical reactions and energy changes, where they learn about how metals are extracted from ores and experimental techniques to make salts; use electricity to split apart ionic compounds via electrolysis, and be able to understand the energy released in reactions and how these can be used to power batteries and fuel cells. Students will investigate the rate of chemical reactions and understand the factors which affect these rates.

Students will continue to develop their 'Working Scientifically' skills through required practical experiments and investigations.



## Year 11

Students continue their journey into Chemistry by looking at organic chemistry including alkanes, alkenes, alcohols, carboxylic acids and esters. They will examine how these compounds react and are formed, as well as how crude oil is used to form many useful products. They examine and begin to explain using chemical reactions how polymers are formed and explore the many uses of natural and synthetic polymers.

Additionally, chemical analysis and the Earth's resources are explored by students investigating methods of chemical analysis such as, how scientists can use simple tests and spectroscopy to indicate the presence of different elements. They examine the development of the Earth's atmosphere and how the burning of fossil fuels is causing change.

Students then look at issues such as sustainability; maintaining resources, the use of resources, for example, making water safe to drink and treating waste water. Students study the assessment of product life cycles; making fertilisers in the lab and industry; making ammonia using the Haber process and reducing waste through reduction, reusing and recycling.

Students will continue to develop 'Maths in Science' skills and additionally, their 'Working Scientifically' skills through required practical experiments and investigations.

# Triple Science Chemistry Key Stage 4 Overview

What is my Learning Journey for Years 9 to 11?

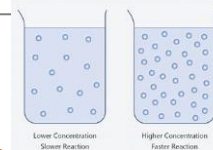


**Content – Recycling, Water, Reducing use of resources, Finite and renewable resources**  
Big picture focus – how recycling can extend the use of resources and positively impact the environment.



**Content – Crude oil, Hydrocarbons and alkanes.**  
Big picture focus – Uses of crude oil and the impact on the environment.

**Content – Affect of catalyst, concentration, temperature on rate of reaction. Reversible reactions**  
Big picture focus – the role of catalysts in everyday reactions.



**Exams:**  
-2x 1 hour 45 minute papers  
There is no coursework element.

**Assessments:**  
-End of unit tests  
--6 mark question practice for each unit

**#realworldready**

- Understanding about the elements that make up the world around us, how we can study and separate each of these elements and compounds.
- Looking at the history behind different scientific theories and understanding how these change over time.
- Topics look at how we can best look after the world around us and live more sustainably.
- Understand the importance of science to a wide variety of careers.

**Useful websites and support**

- GCSE bitesize
- Kerboodle
- Oak Academy
- Seneca
- Ezscience

**Home Learning**

- Weekly interleaving quizzes and homework
- Other tasks may include:
- 6 mark question practice for each unit
- Past paper practice
- Flipped learning tasks

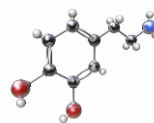
YEAR  
**11**

**C10 Using Resources**

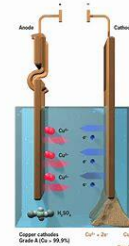
**C7 Organic Chem**

**C6 Rates**

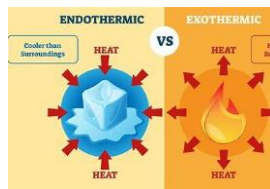
Scan this QR code to take you to the specification we study.



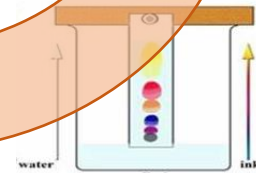
**Content – Calculating formula mass, Conservation of mass, Calculating concentration, Balancing equations**  
Big picture focus – formulae and calculations



**Content – Reactions of metals, Acids, alkalis, salts, Electrolysis**  
Big picture focus – Use of electrolysis in extracting useful products and the financial and environmental impacts of doing so.



**Content – Endothermic and exothermic reactions, Reaction profiles**  
Big picture focus – everyday uses of exothermic and endothermic reactions



**Key Skills:**

- Recall and retention of scientific facts
- Analysing and interpreting data
- Evaluating information

YEAR  
**10**

**C2 Bonding**

**C3 Quantitative**

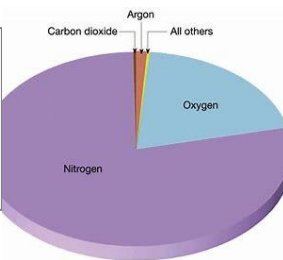
**C4 Chem Changes**

**C5 Energy Changes**

**Content – Three states of matter, Ionic bonding, Covalent bonding, Metals and alloys.**  
Big picture focus – linking properties to bonding

**Content – Chromatography, Rf values, Pure substances and mixtures.**  
Big picture focus – use of analysis techniques.

**Content – Developing the atmosphere, Polluting the atmosphere**  
Big picture focus – climate change, its causes and the likely impact on the world.



**Content – Periodic table, element, compound, atomic structure, groups of the periodic table.**  
Big picture focus – Uses of the periodic table in chemistry.



**C8 Chem Analysis**

**C9 Atmosphere**

**C1 Atomic Structure**

YEAR  
**9**

# Recommended reading for KS4 Science

Title	Author	Year	Science Topic
Atomic Women	Roseanne Montillo	10	Working Scientifically, Atomic Structure, Energy
Never home alone	Rob Dunn	10	Microbes and disease, Working Scientifically, Living things and their habitats, Human Biology, Cells
Exploring the Elements	Isabel thomas	10	Working Scientifically, Elements, Chemistry, Atomic Structure
What If?	Randall Munroe	11	Working scientifically, Cells and Organisation, Health and drugs, Ecosystems, Genetics and Evolution, Particles, Atoms, Elements and compounds, The Periodic Table, Materials, Earth and the atmosphere, Energy, Motion and Forces, Waves, Electricity, Space Physics, Atomic Structure.
Question Everything - 132 Science questions	Mick O'Hare	10	All Biology, Chemistry and Physics
Does anything eat wasps and 101 other questions	Mick O'Hare	10	All Biology, Chemistry and Physics

# Key Stage 4

# Triple Science

# Physics

## Year 9

Students will begin their journey of discovery of the GCSE course by studying the fundamental area energy within Physics. They will learn about the different forms in which energy can exist and how energy changes as the behaviour of an object changes. They will develop their understanding and practice of handling 3-term equations and applying them to find solutions to problems. Students will then learn how different power stations work and address some of the issues around them, examining their advantages, disadvantages and their suitability for use in different situations. Students will carry out required practicals and enhance their working scientifically skills.

## Year 10

Students continue their journey into Physics. Students will learn about electrical circuits and domestic electricity. They will look at current and static electricity, examine series and parallel circuits and their working and circuit symbols. Students will learn the difference between ac and dc and the structure of the plug. They will develop a good knowledge of electrical safety and become adept at using and rearranging the electricity equations. Students will then look at density and how to calculate it. They will look at kinetic theory, linking the arrangement and behaviour of particles to the properties of materials and examine the energy changes within changes of state. They will then look at nuclear radiation, considering its types, properties, benefits, uses and potential hazards. Students will look at nuclear fission and chain reactions and link this to the design and operation of a nuclear reactor. They will also learn about nuclear fusion as the process which powers the sun and could, one day provide limitless clean power on Earth. Students will extend their understanding of forces and Newton's Laws of Motion, including scalar and vector quantities, resultant forces and free body diagrams and the principles of moments.

Students will continue to develop their 'Working Scientifically' skills through experiments and investigations throughout the year.

# Year 11

Students continue their journey into Physics. They will learn more about forces including acceleration, terminal velocity, speed, acceleration and momentum. Students learn to calculate values from distance-time and velocity-time graphs and employ the use of more advanced 4-term equations. They will learn about pressure in each state of matter.

Students learn the different types of waves and the uses and properties of each wave in the electromagnetic spectrum including for medical scans. Students will look in depth at wave properties and behaviour, looking at reflection, refraction, diffraction and dispersion and link these properties to familiar phenomena. Students will look at colour and the mechanism by which we see. They will learn how the two different types of lenses work and how they can be used to form images usefully, in optical instruments in the lab and in the eye and to calculate magnification. They look at magnetic fields, electromagnets and the motor effect to understand and explain how electric motors work. Students will learn the principles of electromagnetic induction to explain how electricity is generated and how devices such as microphones and loudspeakers work. They will then apply all their electrical knowledge to explain the workings of a transformer. Finally, students will look at space, examining the formation of stars and linking the production of elements to nuclear fusion. Students will look at evidence for the big bang such as red-shift and look at theories for the end of the universe. They will also look at the principle of circular motion and link this to the orbits of satellites around the earth.

Students will continue to develop their 'Working Scientifically' skills through experiments and investigations throughout the year, becoming increasingly adept and independent when planning, performing and assessing experiments.



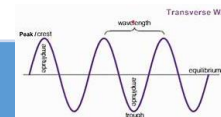
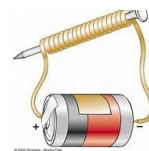
# Triple Science Physics Key Stage 4 Overview

What is my Learning Journey for Years 9 to 11?

**Content** – Big bang theory, Red shift, Lifecycle of a star. The formation of the solar system. Circular motion and satellites.  
**Big picture focus** – To understand theories for the beginning and end of the universe.

**Content** – Permanent and induced magnets, magnetic field, Electromagnets. The motor effect, electromagnetic induction, generators and transformers.  
**Big picture focus** – understanding how electricity is generated and what role electromagnets play in our lives.

**Content** – Transverse and longitudinal waves Labeling a wave, calculating wave speed, refraction, electromagnetic waves uses and dangers. Seismic waves.  
**Big picture focus** – Seeing how we use different types of e-m waves every day.



## Exams:

-2x 1 hour 45 minute papers  
There is no coursework element.

## Assessments:

-End of unit tests  
--6 mark question practice for each unit

## #realworldready

- Appreciate how our Earth is part of a wider system and the study into this.
- Understanding how and why objects act in the way that they do
- Understanding the theories that Scientists have developed over time and how/why these change
- Looking at the use of electricity in everyday lives and how we can develop our usage to be more sustainable.
- Understand the importance of science to a wide variety of careers.

## Useful websites and support

-GCSE bitesize  
-Kerboodle  
-Oak Academy  
-Seneca  
-Ezyscience

YEAR  
**11**



**Content** – Speed, Acceleration, Distance-Time graphs, Velocity-Time graphs, Contact and non-contact forces, Gravity, Hooke's Law, Newton's laws, Scalar and Vectors. Pressure  
**Big picture focus** – how streamlining and design can reduce air resistance and improve efficiency and top speed of a vehicle.



**Content** – Atomic model, Discovery of the atomic model, Isotopes, Ions, Radioactive decay, Uses and dangers of radiation.  
**Big picture focus** – How experiments led to the atomic model and how theories will change over time. How radiation is able to harm us and how we can protect against it.

**P4 Atomic Structure**



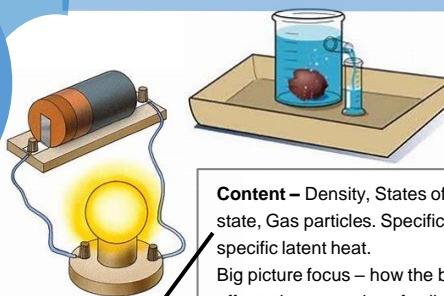
**Content** – Energy stores, Energy calculations, Work, Power, Renewable and Non-Renewable. Energy transfers. Power stations and the national grid.  
**Big picture focus** – how different power stations affect the environment and how to generate carbon free electricity

YEAR  
**9**

**P1 Energy**

**P2 Electricity**

**Content** – Static electricity. Current, Voltage, Resistance. Circuits symbols and how to build circuits. Series and parallel circuits, a.c and d.c, mains electricity. Power, National grid.  
**Big picture focus** – to understand how a.c electricity differs from d.c and what safety features are in place to protect us from shocks.



**Content** – Density, States of matter, Changes of state, Gas particles. Specific heat capacity and specific latent heat.  
**Big picture focus** – how the behaviour of particles affects the properties of solids, liquids and gases

**Particle Model**

YEAR  
**10**

**P3**

Scan this QR code to take you to the specification we study.



## Key Skills:

- Recall and retention of scientific facts
- Analysing and interpreting data
- Evaluating information

Home Learning

-Weekly interleaving quizzes and homework  
Other tasks may include:  
-6 mark question practice for each unit  
-Past paper practice  
-Flipped learning tasks

# Recommended reading for KS4 Science

Title	Author	Year	Science Topic
The Senses	Matteo Farinella	10	Cells, Working Scientifically, Skeleton, Light and sound,
Atomic Women	Roseanne Montillo	10	Working Scientifically, Atomic Structure, Energy
Exploring the Elements	Isabel thomas	10	Working Scientifically, Elements, Chemistry, Atomic Structure
What If?	Randall Munroe	11	Working scientifically, Cells and Organisation, Health and drugs, Ecosystems, Genetics and Evolution, Particles, Atoms, Elements and compounds, The Periodic Table, Materials, Earth and the atmosphere, Energy, Motion and Forces, Waves, Electricity, Space Physics, Atomic Structure.
Lab Girl	Hope Jahren	11	Plants, Botany, Working Scientifically, Photosynthesis, Ecology, Living things and their habitats
The Mysteries of the Universe	Will Gater	10 seps	Space, Physics, Astronomy,
Question Everything - 132 Science questions	Mick O'Hare	10	All Biology, Chemistry and Physics
Does anything eat wasps and 101 other questions	Mick O'Hare	10	All Biology, Chemistry and Physics
The Radium Girls	Kate Moore	10	Radiation



# Key Stage 5

# A-Level Biology

## Year 12

All life on Earth shares a common chemistry. This provides indirect evidence for evolution.

We start our journey, building upon knowledge already gained from GCSE, with an exploration of the cells of all living organisms. We will learn that they contain only a few groups of carbon-based compounds that interact in similar ways. We will discover that nucleic acids carry the genetic code for the production of proteins. The genetic code is common to viruses and to all living organisms, providing evidence for evolution. The most common component of cells is water; hence our search for life elsewhere in the universe involves a search for liquid water.

Students will learn that all cells have a cell-surface membrane and, in addition, eukaryotic cells have internal membranes. The basic structure of these membranes is the same and enables control of the passage of substances across exchange surfaces by passive or active transport. We will also find that cell membranes contain proteins and that these are vital for passage in and out of cells and for cell signalling. We then take a journey through the immune system, looking at the differences between B and T cells.

We follow our journey through to multicellular organisms, delving deeper to find that the internal environment of a cell or organism is different from its external environment. The exchange of substances between the internal and external environments takes place at exchange surfaces. To truly enter or leave an organism, most substances must cross cell membranes.

We then look at the wider world of genes and biodiversity. Biological diversity – biodiversity – is reflected in the vast number of species of organisms, in the variation of individual characteristics within a single species and in the variation of cell types within a single multicellular organism.

## Year 13

As we make the switch to A2 level, we build on our foundations from Year 12.

Life depends on continuous transfers of energy. In photosynthesis, light is absorbed by chlorophyll, and this is linked to the production of ATP. In respiration, various substances are used as respiratory substrates. The hydrolysis of these respiratory substrates is linked to the production of ATP.

We will look further into the nervous system, looking deeper at how our neurons communicate and how these signals are processed around the body. In contrast, mammalian hormones stimulate their target cells via the blood system. We will also learn that plants control their response using hormone-like growth substances.

The theory of evolution underpins modern Biology. All new species arise from an existing species. This results in different species sharing a common ancestry, as represented in phylogenetic classification. We will acquire knowledge of how common ancestry can explain the similarities between all living organisms, such as common chemistry (e.g. all proteins made from the same 20 or so amino acids), physiological pathways (e.g. anaerobic respiration), cell structure, DNA as the genetic material and a 'universal' genetic code.

On the last stop on our journey, we will master gene expression. Cells control their metabolic activities by regulating the transcription and translation of their genome. Although the cells within an organism carry the same coded genetic information, they translate only part of it. In multicellular organisms, this control of translation enables cells to have specialised functions, forming tissues and organs.

# Key Stage 5

# A-Level Physics

# Year 12

Students cover five big topics during this year.

Students begin at the smallest possible level with Particles and Radiation. This builds on prior learning from GCSE but extends into nuclear forces, quarks and leptons and particle interactions, learning new particles and rules for their creating and behaviour. Students learn the principle that energy and matter are interchangeable. They then learn about quantum phenomena from energy levels to the photoelectric effect and fluorescence.

In the second topic, Waves and Optics, students extend their knowledge and understanding of waves from GCSE. Students learn about polarisation of waves and stationary and progressive waves. They will extend their understanding of refraction and total internal reflection by looking at Snell's Law and the refractive index of materials, using these ideas to explain the workings of optical fibres. Students then look at the wave / particle duality of light and the experimental evidence for light behaving as a wave. They look at single and double slits and the diffraction grating and apply formulae to these ideas.

In the third topic, Mechanics and Materials, students take an in-depth look at forces. Expanding on ideas from GCSE and linking to A-Level mechanics in the maths course, students look at equilibrium, balanced forces and moments. They look at the 4 suvat equations of motion and how these are applied in increasingly complex situations. Students look at work done, energy, power and Newton's Laws of Motion. They investigate springs in series and parallel and Young Modulus and how this affects materials.

In the fourth topic, Electricity, students expand upon their knowledge of current electricity and circuits from GCSE. Students learn how to calculate resistance in series circuits and the potential divider. They learn the concepts of electromotive force – emf – and resistivity and how these can be used and applied in circuits.

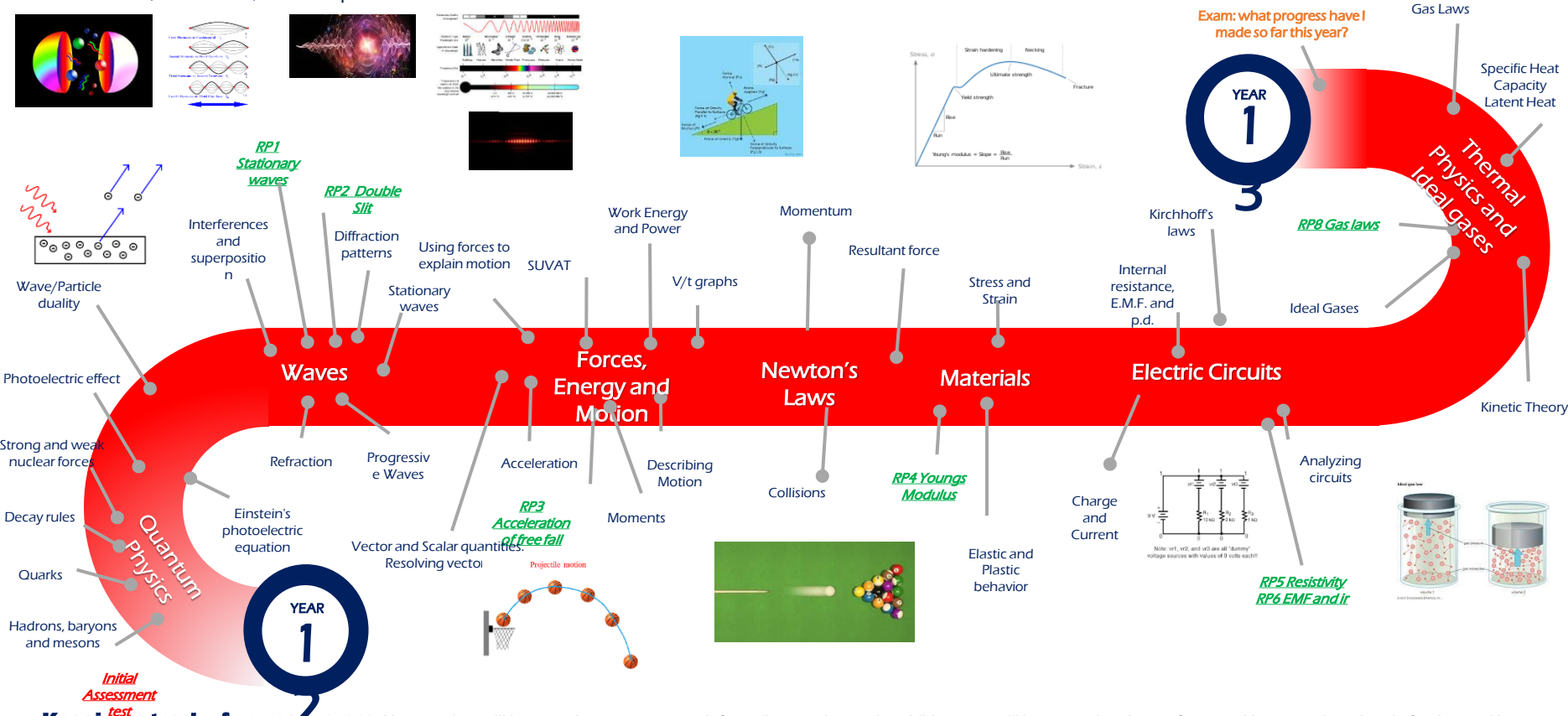
Finally, students begin to look at Thermal Physics, learning the concept of absolute zero, expanding on their knowledge of kinetic theory and gas laws to examine the behaviour and energy in a gas at particle level. Students review and apply the mole concept from GCSE Chemistry.

Throughout the year, students will improve their practical skills during experiments and required practicals and extend their 'Working Scientifically' skills through practice and exposure to new terms and ideas. They will become increasingly independent at planning and carrying out experiments and using more complex equipment. Students will become familiar with experimental errors and their impact on the accuracy of results.

# What will you be learning in Year 12 Physics?

The topics you will study in Year 12 build on your **knowledge** and **understanding** of the **GCSE content** to provide the foundations and principles for further study in science.

This foundation of knowledge, as well as the **practical skills learnt**, will equip you well. The skills you learn in each topic will prepare you for future career as well as to be curious, innovative, and independent scientists!



**Autumn 1**  
Assessed in  
Quantum  
Physics  
Chapters 1  
and 2

**Autumn 2.**  
Assessed in  
Quantum  
Physics and  
Waves  
Chapters 3, 4  
and 5

**Spring 1**  
**JAN EXAMS**  
Assessed in  
Forces and  
motion  
Chapters 6, 7  
and 8

**Spring 2**  
Assessed in  
Forces and  
energy  
Chapters 9  
and 10

**Summer 1**  
Assessed in  
Electricity  
Chapters 12  
and 13

**Summer 2**  
**MOCK**  
**Exams**  
Assessed in  
gas laws,  
Chapters 19  
and 20.

# Year 13

Students study four big topics this year.

Students will begin by studying circular motion and simple harmonic motion. They will see how the principles of motion from Year 12 can be applied to new systems and link simple harmonic and circular motion mathematically.

Students will then study the Fields topic. They will examine in depth the concepts associated with gravitational, electric and magnetic fields. Firstly they will look at gravitational fields, learning about gravitational potential and Newton's laws of gravitation. They will explore the origins of the term 'gravitational field strength' as studied at GCSE and apply their new learning to understand and calculate the motion of planets and satellites. Students will then examine electric fields and see the similarities with electric fields in areas such as electric potential. Students will learn the role and function of capacitors. They will learn and apply Coulombs Law to charged objects, linking back to static charge from GCSE. Students will then examine magnetic fields. They will apply the principles of circular motion to the working of the mass spectrometer, combining them with electric and magnetic field equations. Students will extend their understanding of electromagnetic induction from GCSE using the new laws learned and return to the concept of emf from year 12.

The third topic is Nuclear Physics. Students will build upon their foundation of knowledge from GCSE to examine half-life, types of radioactive decay, nuclear fission and fusion and the working of a nuclear reactor in much greater detail. They will link the exponential decay associated with half-life to that of capacitors.

Finally, students will study the option topic of Astrophysics. They will learn about the construction and use of different types of telescope and how astronomical distance are calculated, including the concepts of the light year, parsec, absolute and apparent magnitude of stars. They will look at the classification of stars and the Hertzsprung-Russell diagram and examine the formation of black holes and methods to calculate their mass and radius. Students will finish by extending their knowledge of red-shift and the expanding universe from GCSE and learning the methods scientists use to detect exoplanets.

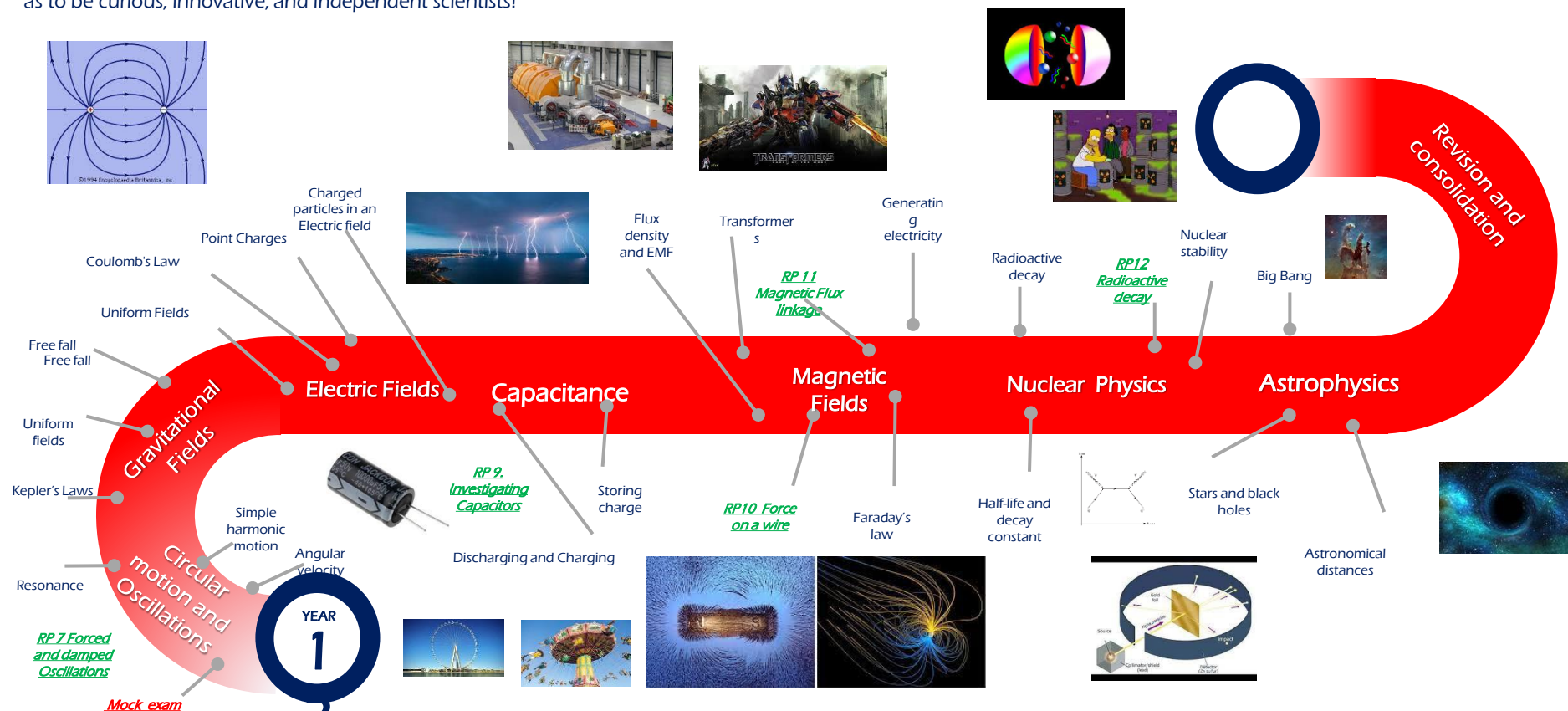
Throughout the year, students will improve their practical skills during experiments and required practicals and extend their 'Working Scientifically' skills through practice and exposure to new terms and ideas. They will become proficient at independently planning and carrying out experiments analysing results and factoring errors as well as using complex equipment.



# What will you be learning in Year 13 Physics?

The topics you will study in Year 13 build on your **knowledge** and **understanding** of the **Year 12 content** to provide the foundations and principles for further study in science.

This foundation of knowledge, as well as the **practical skills learnt**, will equip you well. The skills you learn in each topic will prepare you for future career as well as to be curious, innovative, and independent scientists!



**Keeping a track of your progress:** Your teacher will be assessing your progress informally every lesson. In addition, you will have regular pieces of assessed homework and end of unit tests. You will be expected to keep track of your progress and work with your teachers to plan consolidation and to fill in gaps.

