

CURRICULUM SUBJECT: SCIENCE

SUBJECT CONTACT: K BROWN

“Don’t let anyone rob you of your imagination, your creativity, or your curiosity. It’s your place in the world; It’s your life. Go on and do all you can with it, and make it the life you want to live.”– Mae C. Jemison

CURRICULUM INTENT

Why is it important that pupils at Vale of York study Science?

Studying science is important because it is fundamental for students' future success and contribution to society, especially in a region like North Yorkshire. At Vale of York, we not only equip students with essential knowledge about the world but also prepare them for various career opportunities in key industries of the region.

Career Opportunities: Studying science opens up a wide range of career opportunities for students in industries such as agriculture, tourism, manufacturing, digital and creative sectors, and healthcare. Understanding scientific principles and acquiring problem-solving skills will enable students to pursue careers that contribute to the economy and growth of North Yorkshire.

Support for Key Industries: Science education plays a crucial role in supporting and enhancing various industries in North Yorkshire. For example, in agriculture, understanding scientific principles like soil composition and crop rotation is essential for maximising productivity and sustainability. Similarly, in manufacturing, science education fosters innovation and technological advancement, driving process improvements and enhancing product quality. Parents should recognize that their children's education in science will directly contribute to the success and development of these key industries in the region.

Solving Real-World Problems: Science education enables students to solve real-world problems, ranging from environmental conservation to healthcare challenges. By educating students about the importance of sustainable practices in tourism, for instance, science education helps minimise environmental impact and ensures the long-term viability of tourism in North Yorkshire. Moreover, in healthcare and life sciences, science education is essential for training future healthcare professionals and conducting cutting-edge research that addresses societal health needs.

Preparation for the Future: In an increasingly complex and technology-driven world, a solid foundation in science is essential for students to succeed in their future careers and adapt to rapid changes in the job market. Science education fosters critical thinking, problem-solving, and analytical skills that are transferable across various industries and are highly valued by employers.

Overall, studying science is not only academically valuable but also practically important for their children's future success and contribution to the vibrant economy and diverse industries of North Yorkshire. York is very fortunate to be a leading city in the UK for STEM, being home to York Science Park, Science City York, the National STEM Centre, and the National Science Learning Centre. This provides an abundance of additional opportunities for pupils with an active interest in this area of the curriculum.

CURRICULUM STATEMENT

At KS3: A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and pupils are taught essential aspects of the knowledge, methods, processes and uses of science.

Through building up a body of key foundational knowledge and concepts, pupils are encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They are encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.

At KS4: Teaching in the sciences in Key Stage 4 continues with the process of building upon and deepening scientific knowledge and the understanding of ideas developed in earlier key stages in the subject disciplines of biology, chemistry and physics.

For some students, studying the sciences in Key Stage 4 provides the platform for more advanced studies, establishing the basis for a wide range of careers. For others, it will be their last formal study of subjects that provide the foundations for understanding the natural world and will enhance their lives in an increasingly technological society.

CURRICULUM SEQUENCE

Key Stage 3:

| | Year 7 | Year 8 | Year 9 |
|---|---|--|--|
| Curriculum time (pw) | 7 hours per fortnight | 6 hours per fortnight | 7 hours per fortnight |
| Curriculum framework | <i>Bespoke curriculum covers the National Curriculum and is based upon KS3 AQA specification</i> | | |
| Core knowledge & understanding covered | <p><i>We follow strands of understanding that build upon the topics they have learnt in KS2 and build a solid foundation for the year that follows.</i></p> <p><i>In Year 7 students study the following topics:</i></p> <ol style="list-style-type: none"> 1. Fundamentals of science enquiry 2. Energy 1 3. Fundamentals of chemistry 4. Organisms 1 5. Matter 6. Forces 1 7. Ecosystems 1 8. Genes 1 9. Electricity 1 10. The earth 1 | <p><i>We follow strands of understanding that build upon the topics they have learnt in year 7 and build a solid foundation for the year that follows.</i></p> <p><i>In year 8 students study the following topics</i></p> <ol style="list-style-type: none"> 1. Waves 1 2. Reactions 1 3. Forces 2 4. Organisms 2 5. Reactions 2 6. Waves 2 7. Ecosystems 2 8. Electricity 2 9. Genes 2 10. Energy 2 11. The earth 2 | <p><i>We continue to work on the fundamental topics of science introduced in year 7 and 8 but extend these to bridge between KS3 and GCSE to make sure students are able to tackle the more difficult topics covered in year 10 and 11.</i></p> <ol style="list-style-type: none"> 1. Cell biology 2. Atomic structure and the periodic table 3. Energy 4. Organisation of organisms 5. Bonding, structure and the properties of matter 6. Electricity 7. Bioenergetics 8. Energy changes 9. Particle model of matter |
| Subject specific skills | <p><i>The scientific skills in KS3 science build on each other through a gradual progression in complexity and sophistication.</i></p> <p><i>At the start of KS3, students are introduced to basic scientific skills such as observing, recording, and classifying information, as well as using simple apparatus to make measurements and collect data. They also learn about basic scientific concepts such as matter, energy, and forces.</i></p> <p><i>As they progress through KS3, students build on these skills by learning more advanced techniques for collecting and analysing data, such as making graphs and conducting experiments. They also develop their understanding of scientific concepts in greater depth, including topics such as genetics, ecosystems, and the use of technology in science.</i></p> <p><i>By the end of KS3, students are expected to have a solid foundation in scientific skills and understanding, which they will build on in future years of study. This includes being able to design and carry out experiments, evaluate evidence to draw conclusions, and communicate scientific ideas effectively.</i></p> | | |

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| Personal attributes evolved that support learning | <p><i>Science gives students a unique opportunity to develop the ability to work with challenging equipment and chemicals safely. They are given opportunities to take risks and build their confidence in not only their understanding of science but the practical application of it. From using fire safely to wiring a plug, there are key skills that can be transferred beyond the curriculum.</i></p> <p><i>Students also have opportunities to develop their ability to work as a team, learn from others and support others in their learning. Collaboration is important to scientists as it is to most careers.</i></p> |
| Disciplinary Literacy | <p><i>In KS3 science, literacy skills are integrated into lessons and activities as a way of enhancing students' understanding of the subject. For example, students may be taught how to read and interpret scientific graphs, diagrams, and charts. They may also be taught how to write lab reports, which involves interpreting data and making conclusions based on evidence.</i></p> <p><i>Students are also taught scientific vocabulary and how to use it accurately in speech and written language. Additionally, they learn how to understand and interpret scientific text, including textbooks, articles, and scientific papers. This involves the use of strategies such as skimming, scanning, and close reading.</i></p> <p><i>Overall, the goal of teaching literacy in KS3 science is to help students develop the skills they need to critically analyse and communicate scientific ideas and information.</i></p> |

Key Stage 4:

| | Year 10 | Year 11 |
|---|---|----------------|
| Curriculum time | <p><i>8 lessons per fortnight Combined science (2 GCSEs)</i></p> <p><i>An additional 5 lessons per fortnight for separate science pupils (3 GCSEs)</i></p> | |
| Curriculum framework | <p><i>AQA - Combined science trilogy 2 GCSEs or AQA - Separate science, 3 GCSEs Chosen by the option process and open to anyone who loves science</i></p> | |
| Core knowledge & understanding covered | <p><i>Combined Science (2 GCSEs)</i></p> <p><i>Subject content</i></p> <p><i>Biology</i></p> <ol style="list-style-type: none"> <i>1. Cell biology</i> <i>2. Organisation</i> <i>3. Infection and response</i> <i>4. Bioenergetics</i> <i>5. Homeostasis and response</i> <i>6. Inheritance, variation and evolution</i> | |

7. Ecology

Chemistry

8. Atomic structure and the periodic table

9. Bonding, structure, and the properties of matter

10. Quantitative chemistry

11. Chemical changes

12. Energy changes

13. The rate and extent of chemical change

14. Organic chemistry

15. Chemical analysis

16. Chemistry of the atmosphere

17. Using resources

Physics

18. Energy

19. Electricity

20. Particle model of matter

21. Atomic structure

22. Forces

23. Waves

24. Magnetism and electromagnetism

Assessments

There are six papers: two biology, two chemistry and two physics. Each of the papers will assess knowledge and understanding from distinct topic areas.

Separate Science (3 GCSEs)

Biology subject content

1. Cell biology

2. Organisation

3. Infection and response

4. Bioenergetics

5. Homeostasis and response

6. Inheritance, variation and evolution

7. Ecology

| | |
|---------------------------------------|---|
| | <p>8. Key ideas</p> <p>Chemistry subject content</p> <ol style="list-style-type: none"> 1. Atomic structure and the periodic table 2. Bonding, structure, and the properties of matter 3. Quantitative chemistry 4. Chemical changes 5. Energy changes 6. The rate and extent of chemical change 7. Organic chemistry 8. Chemical analysis 9. Chemistry of the atmosphere 10. Using resources <p>Physics subject content</p> <ol style="list-style-type: none"> 1. Energy 2. Electricity 3. Particle model of matter 4. Atomic structure 5. Forces 6. Waves 7. Magnetism and electromagnetism 8. Space physics (physics only) <p>Assessments There are six papers: two biology, two chemistry and two physics. Each of the papers will assess knowledge and understanding from distinct topic areas.</p> |
| <p>Subject specific skills</p> | <p>Students in KS4 Science need to develop a range of scientific skills to succeed. These skills are:</p> <p>Observation: Students learn to observe phenomena which are occurring in the world around them. This is the cornerstone of any scientific investigation.</p> <p>Communication: Students learn to communicate their own ideas and findings by writing reports, giving presentations, using graphs and tables and using technical</p> |

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| | <p><i>vocabulary.</i></p> <p><i>Analysing: Students learn to analyse data, interpret results and draw conclusions from experiments.</i></p> <p><i>Hypothesis formation: Students learn to create hypotheses, design experiments and test their hypotheses.</i></p> <p><i>Scientific knowledge: Students learn a vast range of knowledge in different scientific disciplines from Physics to Chemistry to Biology. This enables them to come up with hypotheses, design experiments and analyse results in a more sophisticated manner.</i></p> <p><i>Numeracy: Students learn to calculate averages, percentages, ratios, rates, and use other mathematical skills to analyse scientific data.</i></p> <p><i>Creative thinking: Students learn to be creative in their thinking and to use originality to develop new ideas and hypotheses.</i></p> <p><i>In summary, through the development of these skills in a sequential manner, students in KS4 science develop a deeper understanding of science, improve their analytical abilities, enhance their problem-solving skills, and develop creativity in thinking, which equips them to succeed in the field of science.</i></p> |
| <p>Personal attributes evolved that support learning</p> | <p><i>Science gives students a unique opportunity to develop the ability to work with challenging equipment and chemicals safely. They are given opportunities to take risks and build their confidence in not only their understanding of science but the practical application of it. From using fire safely to wiring a plug, there are key skills that can be transferred beyond the curriculum.</i></p> <p><i>Students also have opportunities to develop their ability to work as a team, learn from others and support others in their learning. Collaboration is important to scientists as it is to most careers.</i></p> |

Links to Course specifications:

Combined Science: <https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF>

Separate Science

Biology: <https://filestore.aqa.org.uk/resources/biology/specifications/AQA-8461-SP-2016.PDF>

Chemistry: <https://filestore.aqa.org.uk/resources/chemistry/specifications/AQA-8462-SP-2016.PDF>

Physics: <https://filestore.aqa.org.uk/resources/physics/specifications/AQA-8463-SP-2016.PDF>

CURRICULUM OPPORTUNITIES

| | |
|---|--|
| Within the formal curriculum | <i>Students will experience practical work that will allow them to build confidence in not only their scientific understanding but physical capabilities. They will have the opportunity to make and test chemicals, look at cells under the microscope, and investigate how the world works.</i> |
| Beyond the formal curriculum (out of lesstime) | <i>We run a STEM club with the design and technology department which is open to all students. They also have the opportunity to work towards a CREST award. We also have the opportunity to attend events and competitions at the University of York.</i> |
| Links to other curriculum areas | <i>We have very strong links with other subjects. Maths and English have huge links and we use the skills taught in maths and english to support learning in science. For example, comprehension skills are extremely important in science so that students can read information and identify key information. Maths is also essential to science as it allows students to analyse and evaluate data which they collect or to understand certain scientific concepts. There are strong links with PE through how the lungs work and how the circulatory system works. Geography is also referenced in particular with Ecosystems and how climate and the earth has changed over millions of years. Food technology is linked through the chemistry of food and the tests for different nutrients such as glucose and starch. History covers the history of medicine which links to microbiology and medicines. We also cover the science behind ethical issues such as cloning and embryonic stem cells. These topics are covered from a more ethical standpoint in world views and modern issues.</i> |
| Preparation for adult life | <i>A good foundation in science can lead to many exciting opportunities in the world of work. Careers that involve science are often areas that need more people to work in them or areas that are growing. Succeeding in science will set students up for a successful career and within science or not. Every topic has a specific Career case study attached with the aim of widening and raising children's aspirations</i> |

CURRICULUM IMPLEMENTATION

As an Academy we have a range of clear standards and expectations of our pupils however each subject area has its own individual practices and habits that ensure that it can function to its optimum.

Curriculum delivery:

All pupils from Year 7 are expected to have a scientific calculator with them in every lesson. We recommend a Casio scientific calculator rather than an own brand calculator as they have better functionality allowing pupils to work more efficiently.

Homework:

Homework is set online and is used to help students revise or prepare for learning different topics. The large amount of content in science makes recapping and revising concepts very important to success.

| | Frequency | Expected time to complete | Completion notes and handing in | What to do if stuck |
|----|-----------|---------------------------|---|---|
| 7 | Weekly | 30 minutes | Seneca assignment - Linked on google classroom. To be completed to 80% correct | Attend afterschool Homework club. Use a revision guide to support. Speak to a teacher before the homework is due. |
| 8 | Weekly | 30 minutes | Seneca assignment - Linked on google classroom. To be completed to 80% correct | |
| 9 | Weekly | 30 minutes | Seneca assignment - Linked on google classroom. To be completed to 80% correct | |
| 10 | Weekly | 1 Hour | Seneca assignment - Linked on google classroom. To be completed to 80% correct | |
| 11 | Weekly | 1 Hour | Tassomai -linked on google classroom. Complete 5 daily goals a week | |

SUPPORTING YOUR CHILD

| | Resources to support your child | Relevance - How it helps |
|--------------|--|---|
| Key Stage 3 | See links below Knowledge organisers and revision guides are available to purchase through parent pay | BBC BITESIZE: Complete revision and practice which is free and available online. Provides a resource that students can bring into lessons to support themselves or use for revision. SENECA: Website used to set homework on. It is also excellent for revision and parents can also sign up for free to monitor students work |
| Exam courses | See links below Knowledge organisers and revision guides are available to purchase through parent pay | BBC BITESIZE: Complete revision and practice which is free and available online. Provides a resource that students can bring into lessons to support themselves or use for revision. SENECA: Website used to set homework on. It is also excellent for revision and parents can also sign up for free to monitor students work |

Supporting learning links:

<https://www.bbc.co.uk/bitesize/levels/z4kw2hv>

<https://senecalearning.com/en-GB/>

WIDER INTEREST

Places to visit

<https://www.yorkshiremuseum.org.uk/> & <https://www.railwaymuseum.org.uk/>

These are local museums but visiting any museum will allow pupils to broaden their horizons and enable the application of knowledge.

Science Department recommended reads

Gain a deeper understanding of some key concepts by picking up a book

- Unlocking The Universe - Stephen Hawking and Lucy Hawking
- A Really Short History Of Nearly Everything - Bill Bryson
- On The Origin Of Species - Sabina Radeva
- I Am A Book. I Am A Portal To The Universe - Miriam Quick and Stefanie Posavec
- Kid Innovators - Robin Stevenson and Allison Steinfeld
- KEW: Grow, Forage And Make - Alys Fowler and Heidi Griffiths
- Fourteen Wolves - Catherine Barr and Jenni Desmond
- Diary Of A Young Naturalist - Dara McAnulty
- Where The Wild Things Grow - David Hamilton
- Gory Details: Adventures From the Dark Side of Science - Erika Engelhaupt
- Marie Curie And Her Daughters - Imogen and Isabel Greenberg
- The Awesome Power Of Sleep - Nicola Morgan
- <https://www.newscientist.com/>