

Science

Curriculum Principles

By the end of their secondary education, a student of science at Dixons Broadgreen will:

- Know fundamental scientific principles from biology, chemistry and physics that will provide a foundation for understanding and navigating the world. Student knowledge is structured around the big ideas in science which range from the particulate nature of matter, to the cellular basis of living organisms, to the structure of the universe.
- Understand the processes of scientific inquiry that leads to the creation and development of concepts and theories. Students will understand how science can be used to explain observations and make predictions about natural phenomena.

Our unifying 'sentence' is: The science department empowered students by strengthening their ability to think critically, evaluate evidence and fostered their curiosity of the natural world.

In order to achieve a true understanding of science, topics have been intelligently sequenced based on the following rationale:

- Scientific knowledge is broadly hierarchical in nature – students must have a secure understanding of each key block of knowledge before progressing onto the next stage. Therefore, in order to support this, topics have been meticulously planned and ordered to ensure that students are always building on and deepening their previous learning.
- Biology – At Key Stage 3, students learn about the structure, function and behaviour of living organisms in detail, building up from the microscopic cellular level to the macro-scale interactions in an ecosystem. These topics are then extended with the expectation that students learn to apply this knowledge and make links with other topics at GCSE. In A-Level and BTEC courses these topics are explored further along with others such as metabolism, nucleic acids and animal physiology which lay the groundwork for further study in university.
- Chemistry - At Key Stage 3, students start with a rigorous grounding in the fundamentals of secondary level chemistry: states of matter, the periodic table, chemical reactions and the behaviour of materials. Having mastered the foundation knowledge, students are ready to tackle the more challenging content, such as chemical bonding and quantitative chemistry at GCSE. In A-Level and BTEC courses these concepts are developed further along with topics such as periodicity, chemical kinetics and equilibrium so that students can continue seamlessly to study chemistry at university.
- Physics - At Key Stage 3, students study forces, waves and electricity and magnetism as well as introducing more challenging concepts such as energy, pressure and density. As they continue to study these topics in more detail, the focus shifts to a more quantitative appreciation of the subject matter and the development and application of mathematical skills at GCSE. In A-Level and BTEC courses these fundamentals are explored further and are expanded to include topics such as particle physics, quantum mechanics and astrophysics that prepare them for university.
- Experimental work is a key feature of Science and at the start of Y7, 'working scientifically' skills are taught explicitly. These skills have been carefully mapped across all topics throughout all years so that



students are given opportunities to apply and develop these concepts. For example, each topic deliberately includes several opportunities to revisit graph and table interpretation skills.

The science curriculum will address social disadvantage by addressing gaps in students' knowledge and skills:

- Our curriculum is designed around the most disadvantaged learners. We are careful not to assume any prior general knowledge or cultural capital and always teach new knowledge explicitly.
- The Education Endowment Foundation published a major report in 2017 examining the disadvantaged attainment gap in science. The strongest factor affecting pupils' science scores is their literacy levels. In our department, we actively promote literacy every lesson through reading, annotating and discussing challenging texts. We also support children to answer questions in full sentences by verbally modelling sentence starters, giving adequate thinking time and allowing children to 'turn and talk' with a partner. We plan frequent extended writing tasks and support children with verbal rehearsal activities, sentence starters and keywords.
- Disadvantaged students and those from identified underrepresented groups receive priority for extra intervention sessions. For example, when Teachers create and implement their Intervention Prevention plans. Disadvantaged students are also always prioritised when selecting students for small group trips to museums and universities and for science competitions. At GCSE level, students are provided with suitable revision resources (e.g. revision guides and stationary) to give all students a fair opportunity to be successful.
- All students are taught the same rigorous curriculum – we do not narrow or dilute the curriculum. All students are taught from the same student work booklets so that everyone is given access to the same powerful knowledge. That being said, teachers understand the need to supplement the work booklets with additional practice/scaffolds or extension material, as required for individual students.
- Students with special educational needs or disabilities are given extra support through the use of Learning Mentors. Students have access to a rich and diverse curriculum focussing on key skills and powerful knowledge delivered with the appropriate scaffolding and challenge to ensure all pupils master the entire curriculum.

We fully believe science can contribute to the personal development of students at DBA:

- The social development of our students is nurtured through the explicit teaching and practice of effective teamwork and communication skills when working in groups for scientific investigations. Groups are selected by the teacher to ensure that students learn to effectively collaborate with others from different backgrounds or from outside of their friendship circle.
- Science naturally provides many opportunities for balanced discussions of moral and ethical issues. For example, we explore the moral complexities of organ transplant, the controversial use of genetic engineering and the disputed use of stem cells for disease treatment.
- When teaching topics such as the theory of evolution and the Big Bang theory, this provides a chance to develop students' cultural awareness as we can discuss viewpoints of these theories from different religions and cultures.
- Science lessons also provide a wealth of opportunities to explore personal development relating to physical and mental health. For example, students study the effects of smoking, drugs and alcohol from both a scientific and social perspective. When teaching about the digestive system, students are taught about the importance of a balanced diet and how to interpret nutritional information.



- We want students to become respectful and responsible citizens who contribute positively to society. For example, students are taught in detail about global warming, pollution and energy resources so that they understand the importance of recycling, reducing waste and cutting down their carbon footprint. We also teach our students to critically analyse sources of scientific models so they can more successfully navigate the plethora of unreliable and sometimes false sources of science information available online.

At KS3, KS4 and KS5, our belief is that homework should be interleaved revision of powerful knowledge that has been modelled and taught in lessons. This knowledge is recalled and applied through a range of low stakes quizzing and practice. At KS4 and KS5 additional online work and practice exam questions are set so that key concepts can be applied.

Opportunities are built in to make links to the world of work to enhance the careers, advice and guidance that students are exposed to:

- Problem solving activities are built into the curriculum that allow students to apply scientific knowledge to certain career based scenarios. For example, when learning about health and disease in year 8, students have to write an explanation to a patient from the point of view of a doctor explaining why they are prescribing painkillers rather than antibiotics.
- We aim to work collaboratively with our local community to show the career opportunities available to our students within Science in our city.

A true love of science involves learning about various cultural domains. We teach beyond the specification requirements, but do ensure students are well prepared to be successful in GCSE examinations:

- Opportunities to explore the history and philosophy of science are embedded into the curriculum. For example, reading rich texts about an array of topics, such as: the history of space exploration, Semmelweis' work on Germ Theory and how new chemical elements get their names. Whilst not examined, they are included for engagement and to build cultural capital.
- Although students' practical skills are no longer examined through coursework, they still make up at least 10% of each exam so we believe it is absolutely essential that all students can plan and carry out practicals using laboratory equipment safely and accurately so that they are fully prepared for future study and employment. In KS3, we want students to be exposed to a wide variety of engaging practicals, such as investigations into the effectiveness of different brands of indigestion tablets and hand sanitiser and finding the best metal for making frying pans. In KS4 there is a greater focus on the GCSE Required Practical – but we are not restricted to this list of experiments.



Week	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14
Cycle 1	30/08/22	05/09/22	12/09/22	19/09/22	26/09/22	03/10/22	10/10/22	17/10/22	07/11/22	14/11/22	21/11/22	28/11/22	05/11/22	
Notes	All seating plans to be completed		Baseline test Maths and English						07/11/22 student reset	18/11/22 Data and planning day				
	01/09/22 – Year 7 induction Onboarding	orientation	Science skills	Science skills	Science skills	Cells and life processes	Cells and life processes	Cells and life processes	Forces and space	Forces and space	Forces and space	Particles and solutions	Particles and solutions	
Test					Mini test			Mini test			Mini test			
Retest					Re teach/do now /MWB questions as appropriate through curriculum			Re teach/do now /MWB questions as appropriate through curriculum			Re teach/do now /MWB questions as appropriate through curriculum			
Cycle 2	12/12/22	19/12/22	02/01/23	09/01/23	16/01/23	23/01/23	30/01/23	06/02/23	20/02/23	27/02/23	06/03/23	13/03/23	20/03/23	
Notes	16/12/22 Data and planning day		04/01/23 student reset			Y7 Mid-year exams	Y7 Mid-year exams	Y7 Mid-year exams 10/02/23 Dixons Trust Inset Day	20/02/23 student reset		6/03/23 and 07/03/22 Data & planning days			
	Particles and solutions	Energy	Energy	Energy	Energy	Mid-year assessments	Mid-year assessments	Reproduction	Reproduction	Reproduction	Reproduction	Atoms and elements	Atoms and elements	
Test						Cycle test					Mini test			
Retest	Identify students/knowledge gaps- strategy on IP sheets					Re teach/do now /MWB questions as appropriate through curriculum					Re teach/do now /MWB questions as appropriate through curriculum			
Cycle 3	27/03/23	17/04/22	24/04/23	01/05/23	08/05/23	15/05/23	22/05/23	05/06/23	12/06/23	19/06/23	26/06/23	03/07/23	10/07/22	17/07/22
Notes		17/04/23 student reset	28/04/23 – Y7 parents evening	01/05/22 May Day				05/06/23 student reset						20/07/23 Data and planning day 21/07/23 End of term
	Atoms and elements	Ecology	Ecology	Ecology	Acids and alkalis	Acids and alkalis	Acids and alkalis	revision	Revision and assessment	Revision and assessment	Waves	Waves	Waves	Waves
Test	Mini test			Mini test			Mini test		Cycle 3 assessment					Mini test
Retest	Re teach/do now /MWB questions as appropriate through curriculum			Re teach/do now /MWB questions as appropriate through curriculum			Re teach/do now /MWB questions as appropriate through curriculum		Identify students/knowledge gaps- strategy on IP sheets					Re teach/do now /MWB questions as appropriate through curriculum

Week	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14
Cycle 1	30/08/22	05/09/22	12/09/22	19/09/22	26/09/22	03/10/22	10/10/22	17/10/22	07/11/22	14/11/22	21/11/22	28/11/22	05/11/22	
Notes	All seating plans to be completed								07/11/22 student reset	18/11/22 Data and planning day				
	Onboarding	Orientation	The body	The body	The body	The body	Metal reactions	Metal reactions	Metal reactions	Metal reactions	Forces and motion	Forces and motion	Forces and motion	
Test						Mini test				Mini test			Mini test	
Retest						Re teach/do now /MWB questions as appropriate through curriculum				Re teach/do now /MWB questions as appropriate through curriculum			Re teach/do now /MWB questions as appropriate through curriculum	
Cycle 2	12/12/22	19/12/22	02/01/23	09/01/23	16/01/23	23/01/23	30/01/23	06/02/23	20/02/23	27/02/23	06/03/23	13/03/23	20/03/23	
Notes	16/12/22 Data and planning day		04/01/23 student reset			Y8 Mid-year exams	Y8 Mid-year exams	Y8 Mid-year exams 10/02/23 Dixons Trust Inset Day	20/02/23 student reset		6/03/23 and 07/03/22 Data & planning days			
	Plants and photosynthesis	Plants and photosynthesis	Plants and photosynthesis	Chemical reactions	Chemical reactions	Chemical reactions	Mid year assessments	Chemical reactions	Electricity and magnetism	Electricity and magnetism	Electricity and magnetism	Electricity and magnetism	Variation and inheritance	
Test			Mini test				Cycle test					Mini test		
Retest	Identify students/knowledge gaps- strategy on IP sheets		Re teach/do now /MWB questions as appropriate through curriculum				Re teach/do now /MWB questions as appropriate through curriculum					Re teach/do now /MWB questions as appropriate through curriculum		
Cycle 3	27/03/23	17/04/22	24/04/23	01/05/23	08/05/23	15/05/23	22/05/23	05/06/23	12/06/23	19/06/23	26/06/23	03/07/23	10/07/22	17/07/22
Notes		17/04/23 student reset 20/04/23 Y8 Parents evening		01/05/22 May Day				05/06/23 student reset						20/07/23 Data and planning day 21/07/23 End of term
	Variation and inheritance	Variation and inheritance	Variation and inheritance	Pressure, density and moments	Pressure, density and moments	Pressure, density and moments	Pressure, density and moments	Revision	Revision and assessment	Revision and assessment	Earth, materials and the atmosphere	Earth, materials and the atmosphere	Earth, materials and the atmosphere	Earth, materials and the atmosphere
Test			Mini test				Mini test		Cycle test					Mini test
Retest			Re teach/do now /MWB questions as appropriate through curriculum				Re teach/do now /MWB questions as appropriate through curriculum		Re teach/do now /MWB questions as appropriate through curriculum					Identify students/knowledge gaps- strategy on IP sheets

Week	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14
Cycle 1	30/08/22	05/09/22	12/09/22	19/09/22	26/09/22	03/10/22	10/10/22	17/10/22	07/11/22	14/11/22	21/11/22	28/11/22	05/12/22	
Notes	All seating plans to be completed								07/11/22 student reset	18/11/22 Data and planning day				
	Onboarding	Orientation	C1 atomic structure and the periodic table	C1 atomic structure and the periodic table	C1 atomic structure and the periodic table	C1 atomic structure and the periodic table	B1 Cells	B1 Cells	B1 Cells	B1 Cells	P3 Particle model of matter	P3 Particle model of matter	P3 Particle model of matter	
Test						Mini test				Mini test			Mini test	
Retest						Re teach/do now /MWB questions as appropriate through curriculum				Re teach/do now /MWB questions as appropriate through curriculum			Re teach/do now /MWB questions as appropriate through curriculum	
Cycle 2	12/12/22	19/12/22	02/01/23	09/01/23	16/01/23	23/01/23	30/01/23	06/02/23	20/02/23	27/02/23	06/03/23	13/03/23	20/03/23	
Notes	16/12/22 Data and planning day		04/01/23 student reset			Y9 Mid-year exams	Y9 Mid-year exams	Y9 Mid-year exams 10/02/23 Dixons Trust Inset Day	20/02/23 student reset		6/03/23 and 07/03/22 Data & planning days		24/03/23 Y9 Parents evening	
	C2 Bonding	C2 Bonding	C2 Bonding	C2 Bonding	B2 Organization	Revision/exams	Revision/exams	B2 Organization	B2 Organization	B2 Organization	B2 Organization	B2 Organization	P4 Atomic structure	
Test				Mini test		Cycle test			Mini test			Mini test		
Retest	Identify students/knowledge gaps- strategy on IP sheets			Re teach/do now /MWB questions as appropriate through curriculum		Re teach/do now /MWB questions as appropriate through curriculum			Re teach/do now /MWB questions as appropriate through curriculum			Re teach/do now /MWB questions as appropriate through curriculum		
Cycle 3	27/03/23	17/04/22	24/04/23	01/05/23	08/05/23	15/05/23	22/05/23	05/06/23	12/06/23	19/06/23	26/06/23	03/07/23	10/07/22	17/07/22
Notes		17/04/23 student reset		01/05/22 May Day				05/06/23 student reset	Cycle 3 assessments	Cycle 3 assessments				20/07/23 Data and planning day 21/07/23 End of term
	P4 Atomic structure	P4 Atomic structure	P4 Atomic structure	B3 Infection and response	B3 Infection and response	B3 Infection and response	B3 Infection and response	Revision	Exams	Exams	C9 Chemistry of the atmosphere	C9 Chemistry of the atmosphere	C9 Chemistry of the atmosphere	C9 Chemistry of the atmosphere
Test			Mini test				Mini test		Cycle test					Mini test
Retest			Re teach/do now /MWB questions as appropriate through curriculum				Re teach/do now /MWB questions as appropriate through curriculum		Re teach/do now /MWB questions as appropriate through curriculum					Identify students/knowledge gaps- strategy on IP sheets

Week	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14
Cycle 1	30/08/22	05/09/22	12/09/22	19/09/22	26/09/22	03/10/22	10/10/22	17/10/22	07/11/22	14/11/22	21/11/22	28/11/22	05/11/22	
Notes	All seating plans to be completed								07/11/22 student reset	18/11/22 Data and planning day				
	Onboarding	Orientation	P4 Atomic structure	P4 Atomic structure	P4 Atomic structure	B4 Bioenergetics	B4 Bioenergetics	B4 Bioenergetics	B4 Bioenergetics	C5 Energy changes	C5 Energy changes	C5 Energy changes	P2 Electricity	
Test							Mini test		Mini test			Mini test		
Retest							Re teach/do now /MWB questions as appropriate through curriculum		Re teach/do now /MWB questions as appropriate through curriculum			Re teach/do now /MWB questions as appropriate through curriculum		
Cycle 2	12/12/22	19/12/22	02/01/23	09/01/23	16/01/23	23/01/23	30/01/23	06/02/23	20/02/23	27/02/23	06/03/23	13/03/23	20/03/23	
Notes	16/12/22 Data and planning day		04/01/23 student reset	Y10 Mid-year Exams	Y10 Mid-year Exams			10/02/23 Dixons Trust Inset Day	20/02/23 student reset		6/03/23 and 07/03/22 Data & planning days 09/03/23 Y10 parents evening			
	P2 Electricity	P2 Electricity	P2 Electricity	Revision/exams	Revision/exams	C4 Chemical change	C4 Chemical change	C4 Chemical change	C4 Chemical change	B5 Homeostasis	B5 Homeostasis	B5 Homeostasis	B5 Homeostasis	
Test			Mini test	Cycle test					Mini test				Mini test	
Retest	Identify students/knowledge gaps- strategy on IP sheets		Re teach/do now /MWB questions as appropriate through curriculum	Re teach/do now /MWB questions as appropriate through curriculum					Re teach/do now /MWB questions as appropriate through curriculum				Re teach/do now /MWB questions as appropriate through curriculum	
Cycle 3	27/03/23	17/04/22	24/04/23	01/05/23	08/05/23	15/05/23	22/05/23	05/06/23	12/06/23	19/06/23	26/06/23	03/07/23	10/07/22	17/07/22
Notes		17/04/23 student reset		01/05/22 May Day				05/06/23 student reset	Cycle 3 assessments	Cycle 3 assessments				20/07/23 Data and planning day 21/07/23 End of term
	C3 Quantitative chemistry	C3 Quantitative chemistry	C3 Quantitative chemistry	C8 Chemical analysis	C8 Chemical analysis	C8 Chemical analysis	P5 Forces	P5 Forces	Revision/exams	Revision/exams	P5 Forces	P5 Forces	P5 Forces	P5 Forces
Test			Mini test			Mini test			Cycle test					Mini test
Retest			Re teach/do now /MWB questions as appropriate through curriculum			Re teach/do now /MWB questions as appropriate through curriculum			Re teach/do now /MWB questions as appropriate through curriculum					Identify students/knowledge gaps- strategy on IP sheets

