

The Science Curriculum

When society is looking for answers to questions such as 'How did the Universe begin?' or 'Can we develop a vaccine for Covid-19?' it is not a calculator or a dictionary they turn to for answers. Instead it is scientists who have typically gained enthusiasm for the subject from their lessons at school. The Science Department has an important role to play in passing on scientific knowledge and a passion to solve complex problems to the next generation of scientists.

Science has something to offer every student. There is no better way to learn about science than through purposeful practical activities as part of day to day teaching and learning. The Science Department at The Thomas Hardy School puts a considerable amount of emphasis on practical activities at both KS4 and KS5.

All students start to study GCSE AQA Science on arrival at the school in year 9. In the sixth form students can choose to study A level biology, chemistry, physics or alternatively follow the BTEC Level 3 Applied Science course which has a weighting equivalent to a single A level subject.

GCSE Science Courses

The Science Department at The Thomas Hardy School works collaboratively with its three main feeder schools with, amongst other things, the intention of providing a common curriculum for KS3 science. On arrival at The Thomas Hardy School, in September of Y9, there is an introductory stage where students learn key knowledge and skills. This includes basic lab safety and fundamental practical procedures. Students are introduced to subject specific terms in each of the three science subjects and also the language associated with practical work. This vocabulary is revisited and built upon throughout the students' time at the school.

In the first term of Y9 all students follow the AQA Double Award Trilogy course. After careful consideration of prior data and analysis of several assessments, completed in this first term, students are sorted by scientific ability into Triple Award and Double Award sets. The pace and challenge in the Triple Award groups now increases whilst the Double Award science lessons continue at a similar pace to those experienced in the first term.

GCSE Science Routes

The AQA GCSE Science Specifications offer a clear and logical route through the delivery of the course. However, there are certain topics that are not delivered in exactly the same order as that provided by the exam board.

There are several reasons for typically teaching the course in the same order as that provided in the AQA GCSE Science Specifications:

- The topics are assessed via two written exams for each science subject, these are Paper 1 and Paper 2. To assist with student assessment, it is logical to teach Paper 1 content entirely prior to starting Paper 2 content. This allows actual past papers to be used for assessment. written answers.
- Paper 1 topics are taught prior to Paper 2 topics due to the nature of the content covered. The biology course begins with Cells. A good understanding of cell biology is essential prior to commencing all other biology topics. Cells are the building blocks of all life on Earth. Once

students have a good understanding of cells, including their structure, function and specialised cells they can then apply this information to other topics such as those relating to Organisation, Bioenergetics, Inheritance, Variation and Evolution.

- Chemistry begins with Atomic Structure and the Periodic Table. It is crucial that students have a good understanding of the atom and the arrangements of electrons before they are taught any other chemistry topics. The second topic builds upon this initial knowledge by studying how atoms of different elements can form compounds. This could be through Ionic or Covalent Bonding. The teaching of chemistry continues in a similar logical style where quantitative skills are introduced prior to their use in later topics.
- Physics is also delivered in a logical sequence. It starts with the topic Energy. Students must have a reasonable knowledge of energy stores, systems, changes and transfers before they begin to study in more detail the application of these concepts in later topics. For example, the second topic Electricity naturally follows Energy as it is applying the initial knowledge of energy stores and changes into applications related to electrical circuits. The physics topics also build upon some of the content previously introduced in the chemistry course. This includes but is not limited to Atomic Structure. Ernest Rutherford's alpha particle scattering experiment, taught in the fourth physics topic, Atomic Structure, provides additional evidence for the model of the atom. It also challenges students to appreciate how scientists make hypotheses, collect data from observations and then modify models to fit their evidence.
- Each of the Required Practicals (10 for biology, 8 for chemistry, 10 for physics, 21 for trilogy) are matched to an appropriate Topic. However, there are additional practical activities, investigations and field work completed throughout the course. This is sometimes weather dependent and at other times due to availability of resources, such as heart dissection. Student practical skills are continually developed throughout their study of GCSE Science. This includes: health and safety; independent, dependent and control variables; designing investigations; processing data; graphing skills; drawing conclusions; considering uncertainties.

KS5

Students have the opportunity to specialise in physics, chemistry and biology at A level, with the science curriculum offering the opportunity of a more vocational course in Applied Science.

Practical work remains an integral part of all these sciences and the different sciences also develop different skills in students.

Courses are aligned with the exam board specifications but we look for opportunities to develop their wider understanding of the applications of science and the extent to which models and theories can explain the world, or indeed the universe.

Enrichment

Members of the Science Department appreciate the benefits to students of taking part in extra-curricular clubs, trips and visits. These have unfortunately had to be modified during the pandemic for reasons associated with health and safety. However, in recent years they have included the following:

Y13 visit to CERN, Y12 Studland field work, Genesis Club, Forensics club, Southampton chemistry twilight sessions, Big Bang (various locations), Chemistry Olympiad, Riverlab, Natural History Museum, Science Museum, robotics club, lego league, chess club.

