Statement of intent: purpose of study

“The Oasis Science Curriculum will equip students with the knowledge of the key scientific principles that allow us to make sense of the world around us and the disciplinary knowledge which enables them to be good scientists in their lives – providing opportunities to investigate scientific theories and unpick evidence to derive their own conclusions that will enable them to make good choices for themselves, their families, community and our planet.”

Statement of intent: Our three C's

Character:

The curriculum aims to ensure that students feel successful during their science education, that they feel knowledgeable and that they have become curious, critical thinkers that are able to make well informed decisions that they can communicate and justify effectively

.

Competence:

***Knowledgeable students*:** We want our students to be curious learners who can apply their knowledge to the real world. To do this, we equip them with the fundamental substantive and disciplinary knowledge that allows them to ask good questions, evaluate information, access a range of scenarios and communicate their ideas and conclusions effectively and with confidence.

***Knowledgeable teachers*:** We want to ensure that all teachers are confident in their subject knowledge and potential student misconceptions across all three discipline and that they feel secure in taking ownership of differentiating lessons for the needs of the specific students they teach. We also want to provide lots of opportunities to ensure that our teachers know what their students have mastered and which areas need to be revisited later in the students learning journey. Our teachers are knowledgeable about the science of learning and are therefore empowered to make impactful decisions in the classroom. We know that student attention and focus is essential for learning to take place, so creating a calm and purposeful learning environment comes first. Our consistent approach to lesson structure and assessment allows teachers to focus on planning and practising excellent expositions, responding to errors and misconceptions and supporting students regardless of starting point to experience an ambitious curriculum.

***Knowledgeable leaders*:** We want to enable our curriculum leaders to be experts in curriculum delivery – able to develop the pedagogy of their teams through effective subject specific CPD, observations and feedback. We also want to ensure that they are confident in tracking the progress of their students, identifying gaps in knowledge and underachievement and putting in place effective support to ensure that every child is successful in their science education.

Community:

Our curriculum ensures that our students understand the impact of their decisions on themselves, their families, local communities and our planet. It demonstrates the complexity of these decisions and the importance of individual decisions on the collective. It will encourage students to be advocates for diversity, access to healthcare and a more sustainable way of living.

Statement of intent: core concepts

Core concepts and principles of progression

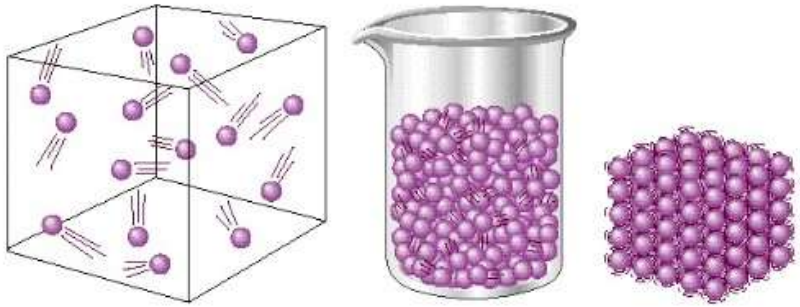
Our curriculum is designed to ensure that our students are **knowledgeable**. This is made up of substantive and disciplinary knowledge. Our curriculum is **well sequenced** so that students learn the most **fundamental knowledge first**, laying the foundations on which all other understanding rest. Over their science education, students will build on this knowledge in order to gain a deeper understanding of the **big, overarching ideas** in biology, chemistry and physics. Our core concepts are:

- **Secure Substantive Knowledge**: we believe that if they have secure **substantive knowledge, they will feel confident in explaining the key scientific principles that govern everything that occurs** within our universe. Concepts are revisited throughout their curriculum to ensure that fundamental knowledge is mastered first and then developed throughout the schemes of learning.
- **Develop Disciplinary Knowledge:** we also want to ensure that students have mastered the disciplinary knowledge **–** they understand how to be *'a scientist'*. We feel it is important that this is taught alongside the substantive knowledge so that students understand how substantive scientific knowledge has been developed over time.
- **Secure subject specific literacy:** We want to ensure that student are equipped with a wide range of scientific vocabulary, an understanding of how scientific ideas are presented and communicated and an opportunity to engage in scientific literature within the curriculum and at home so that they are able to communicate their ideas effectively.

➢ **Link the 'Big Ideas' in science**: over their science education, students will build on this knowledge in order to gain a deeper understanding of the big, overarching ideas in biology, chemistry and physics. From understanding that all material in the Universe is made of very small particles, to the concept that energy cannot be created or destroyed to the key ethical arguments governing science; knowledge is constructed and deepened from the foundations up.

➢ C**oncrete examples and real life contexts:** students have the opportunity to practice application of knowledge and interact with modelled examples repeatedly so that we ensure it is flexible and that they can apply it to a range of different situations & scenarios both within the classroom and more importantly, their real lives.

Practical work: class practicals and teacher demonstrations are integrated into the curriculum so that it builds on and helps to enrich their substantive and disciplinary knowledge. Students complete work accurately and precisely in order to develop their procedural knowledge of the scientific method, giving deeper meaning to their understanding and providing students with the foundations to study science at a higher level.



Statement of intent: aims & outcomes

Equip all students with the **substantive** knowledge

Biology:

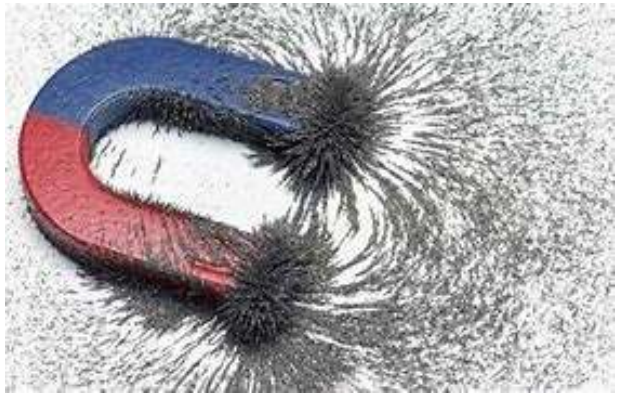
- An understanding of the structure, function and classification of living organisms (including microorganisms, plants and animals).
- That material and energy cannot be created or destroyed, simply converted from one form to another.
- That organisms are continuously interacting and depending on each other and that a change to one organism (including ourselves) can have a huge impact on others.
- An understanding of how we have developed as complex organisms including the inheritance of information and the evolution of organisms over time.

Ch**emistry**:

- That all matter is created from particles, linking this to the properties, classification and uses of a substance.
- Knowledge of the structure of an atom, variation between atoms and changes that can occur to atoms.
- Understanding of the differences between physical and chemical changes and how these can be explained using the particle model.
- The key chemical reactions that occur, linking these to energy changes and the occurrence of these reactions in our personal lives and within medicine and industry.
- The development of the periodic table over time and the association between different elements and their properties linking to extraction and use.
- The composition of the Earth and our Atmosphere and how this is changing over time.

Physics:

- An understanding that the total amount of energy in the universe is the same but can be transferred from one store to another and the ability to identify and describe these transfers.
- Identification of forces acting upon objects and the impact of these forces on the objects (including their effect on their speed, shape and motion).
- Knowledge of waves including key properties, their ability to transfer energy and their effect and use in a range of scenarios.
- Understanding of the key properties of electrical circuits, how to measure these properties and how these properties are linked to each other.
- Knowledge of static fields, magnetism and electromagnetism and the uses of these phenomenon.
- Understanding of the magnitude of ‘space’ and the impact of different astronomical bodies on our lives.



Statement of intent: aims & outcomes

Ensure students have the **disciplinary** knowledge to be 'good scientists':

- **Knowledge of methods for answering scientific questions**: a **secure knowledge of the different ways that scientists investigate scientific questions so that students will be able to decide on appropriate methods of investigation that will enable them to test predictions and evaluate scientific theories for themselves.**

- **Knowledge of apparatus and techniques**: students will have experience of using a range of different pieces of apparatus and techniques so that they can decide on the most appropriate and evaluate their use in different scenarios in terms of safety, accuracy, precision and errors.

- **Analyse data:** students should be able to analyse data gathered or shared with them using a range of **mathematical techniques, tables and graphs. Discuss repeatability and reproducibility of findings and potential sources of error and bias so that they are able to discern between fact and error and justify and communicate their conclusions** effectively.

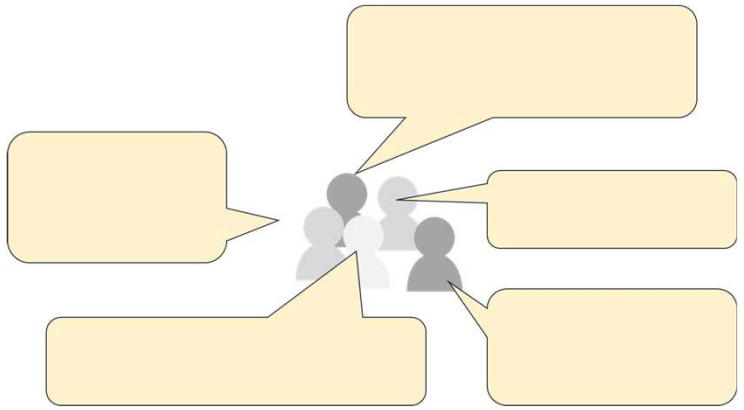
- **Apply mathematical concepts:** students will be able to apply mathematical concepts, conventions and skills to identify patterns and describe phenomenon quantitatively.

- **Use standardised units:** students will be able to use standardised units effectively and perform appropriate calculations**.**

- **Respectful conversation**: the curriculum will create a space for students to engage in respectful conversation around challenging topics which enables them to develop their understanding of the complexity of decisions made within the field of science and how scientific advances have had an impact on the future of our planet.

- **Continuously evolving**: students will understand that scientific theories, laws, models and methods change over time to take into account new evidence.

- **Impact of science on us, our local and global communities:** students should be able to explain the contribution of science to our **past and it's role in our future. They should be able to use their knowledge of science to make well-informed decisions that impact themselves and their local and global community and be able to communicate and justify these to those around them.**



Year 7 Long term plan

This year is designed to provide students with a bridge between the concepts that they have covered in primary school and those that they will go on to study in secondary. It is assumed that all students will enter with a slightly different starting point as they will be joining from a range of different primary schools that will have had different levels of expertise. Within this year, we hope to embed the learning habits and routines that will ensure that these students go on to be successful learners during their time at the school.

Each year is broken into the three disciplines. It is important that students understand the difference between these – biology is the study of multiple factors that effect living organisms and life, Physics, in contrast, typically assumes that entities behave identically. It 'builds its explanations on measurable quantities that can be put into numerical relationships and chemistry draws heavily on the use of models and modelling[footnote 55] to explain the behaviour of matter and routinely involves the synthesis of the objects it studies (Ofsted 2021).

Secure Substantive Knowledge:

- Within the chemistry units, students will be introduced to the concept of particles and using models to explain how these behave. Students will also be introduced to the concept of physical and chemical changes and the periodic table which allows us to organise elements based on their structure and in turn their properties.
- In Spring, during the physics unit, students will be introduced to the fundamentals of forces – that objects have an effect on each other. This is put into context through the effect of forces on motion, stretching of an object and in space. They will also be introduced to the concept that energy cannot be created or destroyed, simply transferred from one store to another. They are introduced to generating electricity and how humans utilise energy transfers to our advantage.
- Finally, within Biology, students will gain an understanding of how we classify organisms into categories based on their features and behaviour. They will also begin to discern between different types of organism based on their cellular structure and how these cells are organised to form complex organisms. They learn how to use a microscope and how we can use this to compare plant and animal cells. During Year 7, we also begin to look at reproduction and how characteristics are passed on via an organisms genetics and how this can lead to evolution of organisms over time.

Secure Disciplinary Knowledge (inc. practical skills):

- Students are introduced to the key experimental vocabulary during the first half term of this year. This is then built on through a series of short investigations where students follow simple methods, choosing appropriate equipment from a selection given. They are taught to draw simple graphs & describe simple relationships. They also begin to apply mathematical concepts such as substituting into a given equation, calculating means and rounding to two decimal places. They also begin to use simple unit conversions. Students also begin to look at historical figures in science and there is the option to have discussions around the lack of diversity within this community of scientists. Students also begin to look at the impact of science on our lives & how we as humans have had an impact on other organisms and habitats. The idea that science is constantly evolving will be introduced as students learn about the development of the periodic table and our understanding of fuels.

Y7

Year 8 Long term plan

Secure Substantive Knowledge:

- During Year 8 Physics, students visit the concept of transferring energy from one place to another through waves. They also investigate how these waves behave in different scenarios and the effect that we are then able to see with our eyes or hear with our ears. Students also begin to look at the transfer of energy within electrical circuits and the use of a circuit to create electromagnets.
- Within the chemistry unit, students build on their knowledge of atoms and the periodic table to look at the structure of atoms and the arrangement of elements in the periodic table based on their properties and the effect of their structure on reactivity. They also begin to look at common chemical reactions and our representation of these using word and symbol equations. They conduct experiments to rank metals in order of their reactivity and use this knowledge to explain how metals can then be extracted from their ores. This links nicely to a closer look at the structure of the Earth and discussions about how humans use the Earth's resources and the impact that we have on our planet.
- Students go on to study humans and plants as organisations, looking in particular at the systems that have evolved within both types of organism that allow them to grow and survive. Students build on their knowledge of different types of organisms on a cellular level and how organisms interact with each other from Year 7 to explain how pathogens cause communicable diseases in humans and how our bodies have evolved to protect us from dying from these diseases. They also begin to look at how science has allowed us to develop medication and vaccinations to prevent illness**.**

Secure Disciplinary Knowledge:

- Students build on their knowledge of elements and compounds to start using symbols to represent these in common equations. They begin to write their own scientific predictions and hypotheses that they test using simple experiments, using data from these to write conclusions. They will start to draw scientific diagrams such as ray diagrams and circuit diagrams. They will begin to use data to draw simple graphs independently, complete simple calculations without help and expand their range of unit conversions. Students will continue to have tricky conversations around topics such as vaccinations and lifestyle choices. They will continue to develop the concept of a continually evolving bank of scientific ideas as they start to talk about our knowledge of transmissible diseases and the composition of the Earth.

Y8

Year 9 Long term plan

Secure Substantive Knowledge:

- Students build on their chemistry knowledge of elements and compounds, looking at compounds and formulae used to represent these substances. They also begin to look at how our concept of an atom has changed over time. They look at patterns and how different groups in the periodic table react and bond together and how this can be modelled using different types of diagram. This unit also builds on the knowledge of common reactions in Year 8 so that students are able to predict which substances will be produced in different reactions and how they would prove that these substances have been made. Students are introduced to electrolysis and how this can be used to separate more reactive elements from their ore and create substances like hydrogen and oxygen.
- Within Physics, students take a deeper look at waves and energy transfers, in particular looking at efficiency of these transfers and the GPE, kinestic energy and elastic potential energy store and how calculations allow us to predict the amount of energy that should be held in that store (should a closed system with no energy loss be used!). Students also start to observe and measure physical properties of waves, representing these using diagrams. Students will be introduced to the different types of quantity within science (scalar and vector). They will look at the quantitative effect of different forces on an objects motion and shape and begin to complete more complex calculations and graphical representations of data.
- Building on the use of the microscope in Year 7, students will look in more details at the types of cells. They will begin to discuss how humans use replication of cells to their advantage and how our concept of the human genome has had an impact on our knowledge of inheritance. They will also look more closely at specific types of communicable disease and how new drugs are developed. They will begin to analyse more complex data sets, using this to draw conclusions. Finally, students will go on to look at the brain and eye and how these complex organs in our body function and are susceptive to damage and how our knowledge of science has once again, allowed us to intervene and in lots of cases, identify the issue and put in place solutions.

Secure Disciplinary Knowledge:

- Within this unit, students are given plenty of opportunities to practice representing elements, compounds and general reactions using symbols. They begin to evaluate the limitations of using particular types of model to represent substances. They write their own scientific hypotheses and test these using the evidence to support their conclusions. They begin to identify anomalies and describe how to deal with them. They start to look at more complete relationships on a graph and use lines of best fit to extract data. They develop their bank of scientific diagrams to include wave diagrams and free body diagrams. They build on their use of the microscope in year 7 to discuss the use of one type of microscope over another.
- They continue to complete calculations of increasing difficulty, calculating means, rounding to a given number of decimal places and signficiant figures and converting a wider range of units without being prompted. There are opportunities to revisit the concept of an evolving scientific knowledge base with discussions around the structure of the atom, developments in microscopes and how these have supported our understanding of scientific concepts. Students also begin to apply their knowledge of science to explain how we have used this to extract resources from the Earth and how this has at times, been wasteful.

Y9

Year 10 Long term plan

Secure Substantive Knowledge:

- Students look further at humans being complex systems, looking at the different types of respiration and how the body is designed to ensure that these systems work effectively together. They use their knowledge of enzymes from Year 8 to look at the impact of different factors on enzymes and therefore rates of reaction in the body. Developing their knowledge of how substances can move from one place to another, they look at examples of this happening in both humans and plants and how this is determined by concentration and the size of particles. Building on the work in Year 7, students also look at how complex the interactions between organisms can be and the effect that humans can have on disrupting these relationships and how humans can utilise other living organisms to their advantage. Students should also be introduced to how damaging this can be and how science can be used to help us to prevent this having a truly negative impact on ecosystems.
- Within the physics unit, students will look in more details at radiation. They will the interaction of light waves with different surfaces and substances, radiation from unstable radioactive atoms and the impact of gaining and losing kinetic energy on temperature and state of substances. Finally, they will look at the impact of forces on different surfaces both in solids and fluids. Building on knowledge of circuits from Year 8, students will look at the relationship between current, potential difference and resistance. They will link this to transfer of energy across the country. Finally, separate science students will revisit the magnitude of space and the role of different forces in the phenomenon that exist within our universe.
- Finally, students will use their knowledge of chemical reactions to look at factors affecting reactions quantitatively and qualitatively. They will build on their understanding of using equations to represent reactions to illustrate the theory of conservation of mass using a number of different calculations. They will look further at the changes that have occurred to our planet since it's creation and the impact that humans are having during our life time. They will also learn about the use of resources by humans and how science has enabled us to manufacture new materials that allow us to live our lives with more ease.

Secure Disciplinary Knowledge:

- Students use models to represent a range of different scientific phenomenon and can discuss the limitations of using these. They test hypotheses using more complicated scientific invetsigations and use the data from these quantitatively and qualitatively. They are able to suggest a range of techniques that would be appropriate to use within an investigation and are able to discuss why they have chosen one over another. Students can decide on the most appropriate method to present data and are able to evaluate their data sets based on repeatability, reproducibility, accuracy and precision.
- Students can complete multistep calculations, round numbers to a number of decimal places and calculate the volume of different 3D shapes. They will also be able to use a tangent to complete quantitative analysis of data presented in a graph.

Students will have discussion around the start of life, changing models of the solar system and our understanding of electricity. There will also be further opportunities to develop students knowledge of their impact on the world around them (e.g. distribution of organisms) and how

Year 11 Long term plan

Secure Substantive Knowledge:
These units of work have been placed here as they require students to have good conceptual understanding of a wide range of different topics. They require students to have this understanding as they link multiple topics together and without secure knowledge of each contributing area, students will struggle to have the working memory to be able to make these connections.

- Students start by looking at the use of biology to our advantage. The briefly revisit natural selection and evolution and then look at two outcomes of evolution – the nervous and endocrine system that have allowed us to control a multitude of factors within the body.
- Within the chemistry unit, students revisit bonding as this provides the fundamental knowledge for this unit. They then go on to look at how substances made of very similar elements, all covalently bonded together can have a huge range of properties and therefore uses.
- Finally, within the physics unit, students look at the application of forces and energy in our lives.
- The content in this year is designed to finish by February in Year 11 to allow for some time to revise and practice core concepts that students may need additional support with.

Secure Disciplinary Knowledge:

- During this final unit, students are expected to be able to pull together all of the skills that they have developed over the previous five years. They build on their concepts of how scientific theories have developed, discussing investigative processes such as Dolly the sheep and by looking at what has gone wrong and using this to develop hypotheses that can then be tested. They also make use of their knowledge of scientific diagrams to draw organic compounds and use these models to represent reactions that happen within organic chemistry.
- Students are expected to process data quantitatively and qualitatively from graphs and tables. They have opportunities to develop their use of multistep equations Students have opportunities to discuss fertility and contraception and the debates that occur between science and religion. They also learn more about the impact of science on our lives for example in looking at our use of motor effect within Physics and stem cells within Biology and treatment of medical conditions using these.