Statement of intent: purpose of study

"The Oasis Science Curriculum will leave students with a deep appreciation of the big ideas of science and an ability to use them to explain the world around them. We will equip our students with the knowledge they need to appreciate the wonder of the universe and the human capacity to make sense of it.

Our students will develop a sense of what science 'is' and how scientific knowledge has been developed through prediction, experimentation and the gathering of evidence. This will give our students the ability to act as global citizens able to grapple with the major issues of their generation and make good choices for themselves, their community and our planet."

Statement of intent: Our three C’s

Character:

We develop students’ character through warm teacher – student relationships and a balance of teacher exposition and dialogic discussion while we explore the human capacity to explain the material world. We work to enable students to be joyful at the wonder of the universe and our capacity to understand it, humble about our place within nature and hopeful about societies capacity to overcome the ecological crisis they have inherited.

Competence:

We develop our students’ competence through a curricula model that starts from students’ existing knowledge of the world and gives them the experiences and explanations they need to develop a more scientific understanding. We have structured our curriculum so that students build up their sense of the key concepts gradually through being exposed to them in a range of contexts developing their ability to recognise the power of a small number of big ideas to explain a wide range of phenomena. By doing this we aim to create students who can retain a wealth of scientific knowledge they can use flexibly in and beyond the classroom.

Community:

Our curriculum moves back and forwards between developing students’ core knowledge of science and applying it to the major issues affecting the planet – climate change, biodiversity loss and the impact of pollution. By enabling students to relate their knowledge to these issues and make sense of the enormity of them we leave our students with the knowledge and skill they need to understand the issues and a deep sense of hope that science provides us with the potential to change and transform our world for the better.

Statement of intent: principles of progression

Principles of progression

Our curriculum is designed to ensure that our students are **knowledgeable.** Our curriculum is **well-sequenced** around a series of big questions starting from students' own experience of the world and moving towards a more developed scientific understanding. Over their science education, students will build up their knowledge of the most significant concepts in biology, chemistry and physics.

- **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 students engage with the most important concepts in a range of applications and contexts.
- **Experience of phenomena: w**e feel it is important that students experience many of the phenomena they are studying. The tacit knowledge they gain strengthens and reinforces their declarative knowledge as they move through the curriculum. Experiencing phenomena also provides opportunities for students to challenge the existing models by making and justifying predictions.
- **Develop Disciplinary Knowledge:** we also want to ensure that students have mastered the disciplinary knowledge **–** they understand and have some experience of what it means 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.
- **Investigative and practical skills:** structured into our units are opportunities for students to carry out investigative work into the concepts they are studying. 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.
- **Secure subject specific literacy:** We want to ensure that students 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 discussions within the curriculum and at home so that they are able to communicate their ideas effectively.
- **Link the 'Big Questions' 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.
- **Concrete examples and real life contexts:** students have the opportunity to practise application of knowledge to meaningful real life contexts 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.

Statement of intent: Big Questions

We have structured our curriculum around the most significant concepts in science and mapped students' development of these concepts through lesson sequences and topics. To give our curriculum a deeper structure when designing it we have thought about how students knowledge of those concepts enables them to answer our "big questions" in greater depth. This enables our teachers to think about both deepening students knowledge of concepts and developing meaningful connections between those key concepts. Our big questions have been developed from the ASE and Royal Societies project and are closely linked to the idea of the "big ideas" of science.

Biology	Chemistry (& Earth Science)	Physics
What are living things made of? Topics: B1, B3, B11, B15, B16, **How do organisms grow and reproduce?** Topics: B2, B6, B9, B20 **Why do organisms depend on each other and their environment?** Topics: B8, B10, B13, B18, B21 **Why are living things so diverse?** Topics B4, B7, B14, B20 **What keeps organisms healthy?** Topics: B5, B12, B17, B19	**What are substances?** Topics: C1, C2, C12, C14, C15, C21, C22 **What gives substances their properties?** Topics C3, C16, C17, C21 **What is chemical change?** Topics C4, C6, C9, C10, C13, C18, C19, C20 **How does chemistry affect the Earth?** C7, C10, C11 **What is the Earth made of and how is it changing?** C5, C7, C8, C11, C23, C24	**What is matter?** Topics: (C1) P3, P17, P18 **Why do things move and change?** Topics: P1, P5, P7, P13, P14, P19, P20 **How does information and energy spread?** Topics: P2, P3, P6, P8, P10, P21 **What is electricity and magnetism?** Topics: P9, P11, P12, P15, P16, P22 **Where are we in space?** Topics: P4

Statement of intent: aims & outcomes

Our curriculum will equip all students with the **substantive** knowledge to meaningfully answer our big questions as well as the **disciplinary** knowledge to appreciate that our answers are based on the best evidence we have and may be subject to change.

Biology:

- The cell is the basic unit of life from which all organisms emerge. Organisms are adapted to survive in their environment. Multicellular organisms have complex levels of organisation to maintain the conditions for life
- Organisms reproduce by passing on their genetic information from one generation to another.
- Organisms compete with and depend on other organisms for the basic materials and energy that cycle through ecosystems. A change to one population, or environmental condition can have a huge impact on biodiversity.
- The diversity of organisms, living and extinct, have evolved by the process of natural selection.
- That biology enables us to study how organisms can stay healthy and how to prevent disease.

Ch**emistry**:

- Objects are made from materials. and materials are made from one or more substances built from atoms. Chemistry is the study of pure substances with defined chemical and physical properties.
- The observable properties of any substance are determined by how its atoms are held together by electrostatic attractions.
- Chemical change is the rearrangement of atoms to make new substances. Chemists study different types of chemical change and how to control the rate and extent of chemical change. All chemical change requires an exchange of energy with the surroundings
- Chemistry has had a profound impact on our environment. From erosion to climate change green chemistry is being developed to tackle these challenges.
- Chemistry enables us to understand the structure of the Earth, the minerals it is made off and the substances that make up its atmosphere.

Physics:

- All matter is made of particles. The particle model can be used to explain how matter behaves.
- Forces can be used to explain why things move and change. The idea of energy allows us to predict the extent of change that is possible.
- Energy is always being dissipated into smaller and less useful stores. Waves, including sound, water and electromagnetic waves transfer energy and information.
- The movement of charge forms electrical current and causes magnetic fields. We use electrical currents to power our society.
- We are a tiny planet in a vast universe. All mass in the universe attracts other mass with a gravitational force. We can use the idea of gravity to explain how the universe is changing

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. They should be able to 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

The fundamentals of **chemistry.**	*Year 7 starts by giving meaning to the term "chemical substance" starting with our first two big questions before establishing the basis of what "chemical change" is.* *Students start by classifying substances and mixtures by their melting points before looking further into how mixtures can be separated by physical processes. Later topics introduce some means of classifying substances (giant vs molecular; element vs compound) and a model of chemical change as the rearrangement of atoms to form new substances. Our unit on solubility develops students knowledge of this physical properties as well as students procedural knowledge around reading and interpreting graphs.* **C1**: Introduction to substances **C2**: Classifying and changing substances **C3**: Solubility **C4:** Introducing chemical reactions
Basics of **biology**	The two largest units in Y7 biology look at the big question "What living things are made of" with shorter units establishing some core concepts (the genome, variation) needed to access the question "why are living things so diverse?" We start by building up the concept of the cell as the basic unit of life. We advance the idea that all life has a "genome" (genetic material) that is passed on to their offspring and demonstrate that this genetic material can be extracted as a chemical substance called DNA. Using humans as the most accessible example we build students understanding of levels of biological organisation – exploring how each organ system works together to maintain the conditions needed for the bodies cells to survive. **B1:** Cells the unit of life **B2:** Inheritance and the genome **B3:** From cells to organ systems **B4:** Variation
Physics: Forces and energy	Our introduction to physics focuses on the key concepts of "force" and "energy" to begin to challenge students prior conceptions in answer to the big question "why do things move and change?". Our unit on Light and sound established the basis of sight and hearing in beginning to form students answer to "How does information and energy spread?" before formally introducing the concept of "waves" in Y8. We start physics by looking at the forces most readily experienced by students – those to do with motion. We carefully encourage students to accept the counter intuitive notion of "balanced and unbalanced" forces determining motion and look in depth at friction to give this idea meaning. Students are introduced to the big idea of "energy" and the idea it can be in different stores. We develop students' ideas of light and sound radiations in advance of further study in Y8 looking at images and mechanical waves. Y7 physics finishes by looking at how the concepts of heat and temperature relate to the idea of energy. **P1:** Forces and energy **P2:** Light and sound **P3:** Heating and cooling

See concept mapping document for detailed break down of concept development, substantive & disciplinary knowledge

Year 8 Long term plan

Physics in context: more on forces and waves	*Year 8 is the only point all learners will explore "where we are in space" a unit built around the "big idea" of gravity as a non contact force. Students then develop further their answers to "Why do things move and change?" by looking more at motion and other applications of forces. Y8 also introduces the concept of the "mechanical wave" by studying the particle vibrations in water and sound waves.* *Students start by learning what we mean by "down" before exploring the scientific explanations for night and day, seasons and the motion of the planets. We then pick up the idea of "what makes things change" through an exploration of motion including more on procedural skills around graphs. Y8 also explore three key applications of forces – turning effects; why floors support objects (compression) and an investigation of hooks law. We also develop our big question of "how information spreads" by looking at images and mechanical waves. Y8 includes an investigation into reflection and a simple explanation of refraction* **P4**: Earth in space **P5:** Moving by force **P6:** Making images **P7**: More on forces **P8**: Waves on water and air
Chemistry: Changing the Earth.	*Y8 chemistry is focused on the big questions of Earth science "What is the Earth made of and why does it change?" and "how does chemistry effect the Earth?". Our Earth sciences scheme is broken up by "core chemistry" units looking more deeply at "what is chemical change?" to build links between the study of substances and chemistry's "natural world" applications.* *We revisit the idea of pure substances, mixtures, physical processes and chemical change by looking at our own planet. Chemistry in Y8 starts with looking at rocks and minerals (mixtures and "pure" substances) before developing students understanding of the different types of chemical reaction. Students are introduced to the idea that the world around us is made up chemical substances which are constantly changing as a result of chemical and physical processes. Topics on the water cycle and acids and bases build to an explanation of the acidity of "pure" rain water before returning to look at how weathering and erosion occur because of both chemical and physical changes.* **C5**: Dynamic Earth **C6**: Types of chemical reaction **C7**: Air pollution **C8**: Evaporation and the water cycle **C9**: Exothermic and endothermic reactions **C10**: Acids and alkalis **C11**: Weathering and the rock cycle
Biology: studying living things	*Y8 starts by exploring the concepts of health and disease in students first exploration of the big question "What keeps organisms healthy?". Other units start students journeys into other big questions. "How organisms grow and reproduce?" is studied in unit's B6 and B9. Y8 biology ends with "Why do organisms depend on each other and their environment?" with students being introduced to a basic understanding of the concept of "interdependence" ahead of a more detailed journey into ecology in Y9. Our short unit on "biochemistry" consciously follows our Y8 units on chemical change enabling students to appreciate the links between disciplines. This looks at a few of the key chemical reaction in cells – drawing students attention to the sub-microscopic world of substances within cells know their chemical schema is more developed.* **B5**: Health and disease **B6:** Growth and life cycles **B7:** Classification **B8**: Biochemistry **B9**: Reproduction **B10:** Interdependence

Year 9 Long term plan

Biology: The wondrous diversity of life and its human stewards	*Our Y9 curriculum provides a bridge between KS4 and KS3. We start with returning to the big question "what are living things made of?" with a substantial unit building up students concept of "cells" first introduced in topic B1. We then look deeper into the idea of "infection" and introduce the concept of "pathogens" in answer to the question "what keeps organisms healthy?" with a conscious decision to focus on both plants and animals.* *The two most significant units of Y9 biology are topics B13 and B14 looking in detail at the ideas of evolution by natural selection and students impact on biodiversity. We aim for students to have a rounded understanding of the scientistic answer to why life is so diverse and a deep understanding of how various human activates threaten fragile ecosystems.* **B11:** the cellular basis of life **B12:** Health and infectious disease **B13:** Biodiversity and human impact **B14:** Variation through evolution
Chemistry: The periodic table, rates and structure of the atom.	*Year 9 chemistry returns to our three core "big questions" of chemistry and introduces students to how chemical knowledge is represented on the periodic table and a more complex model of the atom.* *Year 9 starts by introducing the periodic table by looking at the meaning of the term periodic and the patterns in physical and chemical properties down the groups. Our unit on rates of reaction builds upon prior knowledge "What is chemical change?" to develop a meaningful chemical definition of "rate". Students are introduced to the Bohr model of the atom for the first time and use it to explain the trends in the periodic properties of the elements. Year 9 also includes a practical unit returning to the separation techniques introduced in year 7 to develop a more rigorous procedural knowledge of these techniques.* **C12**: The periodic table **C13**: Rates of reaction **C14**: Substances and mixtures **C15**: Structure of the atom
Physics: Developing ideas of electricity and magnetism	*We intentionally wait to begin the question "What are electricity and magnetism?" until Y9 because of the cognitive demands of both the practical work required and the abstract modelling of electricity. A substantial period of time is spent in year 9 embedding the practical skills of using circuits and qualitative relationships between the concepts of current, voltage, resistance and energy. Y9 also sees students build on their understanding of the particle movement of water and sound waves to look at the graphical representations of waves.* *Y9 finishes with a unit building students understanding of "density" and pressure. Topic 13 is one of our most challenging topics pushing students towards a complicated application of balanced and unbalanced forces to make sense of pressure in fluids and convection.* *P9: Electricity* P10: Waves P11: More on Electricity P12: Magnetism P13: Floating and sinking

Year 10 Long term plan

Physics: Energy and energy transferred.	*Y10 physics is linked together by the big idea of energy which underpins several of our key questions. Across all topics students are supported in recognising the qualitative nature of physics. That we can use mathematical relationships between (sometimes abstract) concepts to make accurate predictions about phenomena. Students investigate this further through a series of required practical's. All physics topics in year 10 are in essence applications of the big idea of "energy transfers" and that modelling them mathematically enables us to make accurate predictions. This supports students understanding of role of mathematical modelling which is central to how knowledge is developed within physics.* *Students also cover a short unit developing their understanding of the concept of the particle model and atomic structure in answer to "What is matter?" The final units being placed at the end of the sequence because of their overlap with big questions within chemistry.* **P14**: Energy **P15**: Electricity **P16**: Domestic uses of electricity **P17**: Particle model **P18**: Structure of the atom and radiation
Chemistry: Chemical bonding.	*The aim of Y10 is for students to make a qualitative leap in their answers to the first two big questions of chemistry. We start by bringing together several Y9 topics and introducing a simplified electrostatic model of the atom. This model of the atom is used throughout topic C17 to link the different types of chemical bonding to one central underlying concept (electrostatic attraction). This encourages students to develop a more flexible schema around chemical structure to support further progression. Students then return to more complex examples of chemical change supported by their more advanced understanding of the nature of chemical bonding.* **C16**: The periodic table & structure of the atom **C17**: Chemical bonding **C18**: chemical changes **C19**: Qualitative chemistry **C20**: Rates of reaction (C2 content)
Biology: Systems within cells and organisms	*KS4 biology starts by developing a cellular basis for students concept of "growth" before returning to ways substances are transferred across the cell membrane (last dealt within detail during Y7). Our start to KS4 biology is linked together by a focus on "systems" within organisms leading students to an understanding of how different processes within organisms are themselves interdependent. B17 is a vast unit which starts with looking at enzyme action and biological molecules (sub-microscopic - biochemistry) and digestion before linking together ideas of biological organisation (what are living things made of?) with health and disease (how do organisms stay heathy) at the level of organs and organ systems. The year finishes with a look at the development of drugs and vaccinations before deepening students knowledge of the biochemistry introduced in Y9.* **B15:** Cell structure, division and transport **B16:** Systems and organisation **B17:** Infection and disease **B18:** Bioenergetics

Year 11 Long term plan

Chemistry Chemistry n a changing planet.	*Y11 Chemistry comprises a series of short units which picks up and develops ideas covered earlier in the course. The units, covering C2 chemistry are linked thematically by the application of chemistry to societies' interaction with our planet and its resources.. C22 explores organic chemistry for the first time – picking up from work in Year 8 looking at how fossil fuels are created. C24 and C25 similarly pick up the story of how chemistry affects the Earth from topics C7 and C11 in Year eight.* **C21**: Organic chemistry **C22**: Chemical analysis **C23**: Earths atmosphere **C24**: Using the Earth's resources
Physics: Why objects move and information spreads	*Our final year of physics returns to one of the most central concepts in physics – force. Both unit P19 & 20 give a more developed, and quantitative, treatment of the ideas of force and motion developed in years seven and eight. Introducing acceleration equations, velocity-time graphs and the conservation of momentum. Units P21 builds on the Year 9 unit "waves" by looking at the electromagnetic spectrum and wave equations. Physics finishes by returning to the idea of electromagnetism introduced in P12 and exploring the motor effect.* **P19**: Forces and their effects **P20**: Force Motion **P21**: Waves **P22**:electromagnetism
Biology: Systems within cells and organisms	*Biology starts with the looking briefly at the nervous system before exploring the uses of hormones within the human body. B20 develops a model of inheritance and relates it back to the ideas of evolution first explored in detail in unit 14. Our biology story closes with a final unit looking at ecology and the human threat to biodiversity that was covered in some depth in unit B13.* **B19:** controlling our bodies **B20:** From Inheritance to evolution **B21:** ecology

Year 7 Detailed long term plan

Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
L1. Introduction to science L2. Base line test (optional) **Topic C1: What are substances and mixtures** L1. What are substances? L2. Is Orange juice pure? L3. Do things disappear when they dissolve? L4. Can we prove if an ink is pure? L5. What is melting? L6. What is boiling? L7. How does a filter work? L8. Can we prove gases are made of particles? L9. Can we separate the salt from the sea? L10. Can we separate the cherry from the cherry coke? L11. Cherry coke practical (optional) L12. End of topic test C1 L13 Master and feedback **Topic C2: What are substances?** L1. What are elements? L2. Why do metals have high melting points? L3. Why are there so many substances? L4. What is the difference between a compound and a mixture? L5. How do chemists represent substances?	***C2 continued*** L6. What do chemical formulas represent? L7. How is chemical change different from physical change? L8. How do chemical changes form new substances? L9. EOTT What are substances. L10. Feedback and mastery **Topic C3: Solubility** L1. Why do some substances dissolve L2. How can we increase solubility? L3. How do we use graphs of solubility (optional) **Topic C4: What are chemical reactions** L1. How do we represent chemical change? L2. How can equations help us observe reactions? L3. What do symbol equations represent? L4. What happens to mass in a chemical equation? (optional) L5. How does the solubility of substances effect our observations? L6. What happens to mass in a reaction (Pt2 if complete option lesson). L7. EOTT C4 (or optional OCL assessment point). L8. Feedback and mastery **Topic B1: Cells – the unit of life** L1. What makes something alive L2. What are all living things made of? L3. What are animals made of? L4. What are plants made of? L5. Why can we not see cells?	***B1 continued.*** L6. How many types of cell are there? L7. How does a cell get what it needs to stay alive? L8. How do substances move in and out of a cell? **Topic B2: Inheritance and the genome** L1. What makes us all unique? L2. What characteristics can be inherited L3. Where is our genome stored? L4. Can we see the DNA in fruit? L5. EOTT B1 & B2 L6. Mastery and feedback **Topic B3: From cells to organ systems** L1. What are we made of? L2. What are other organisms made of? L3. How does our digestive system work? L4. How does our digestive system keep us alive? L5. How do our lungs work? L6. Why do we need to breathe? L7. How do substances get around the body? L8. Why do we need a circulatory system? L9 Are our bones made of cells? L10 How do we move? L11. EOTT B3 L12. Mastery and feedback	**Topic B3 continued.** L8. Why do we need a circulatory system? L9 Are our bones made of cells? L10 How do we move? L11. EOTT B3 L12. Mastery and feedback **Topic B4: variation.** L1. What is a species? L2. Investigating variation Pt 1 L3. Investigating variation Pt 2 L4. What are fossils? L5 What can the fossil record show us? L6. EOTT Variation L7. Mastery and feedback **Topic P1: Forces & energy** L1. What are forces? L2. How do we represent forces? L3. Why are some objects stationary? L4. When do objects change their motion? L5. Can we predict how an objects motion will change? L6. Why do things stop moving? L7. Can we reduce friction? L8. Investigating friction Pt 1 L9 Investigating friction Pt 2	***P1 continued*** L6. Why do things stop moving? L7. Can we reduce friction? L8. Investigating friction Pt 1 L9 Investigating friction Pt 2 L10. What is the cost of moving? L11. What are the different stores of energy? L12. What happens to energy when forces move an object L13. Describing energy transfers (optional) L14. Why do moving objects heat up? L15. EOTT P1 L16. Mastery and feedback **Topic P2: Sound and light** L1. What is sound L2. Why can we hear better under water? L3. Why do we get shadows? L4. How does light fill a room? L5. Why are some objects reflective? L6. How do we “see” objects	***P2 continued*** L7. How do we get different colours of light? L8. What colour is sun light? L9. Why do some objects appear black? L10. Why do some objects appear coloured? L11. EOTT Sound and Light L12 Mastery & feedback **Topic P3: Heating and cooling** L1. What is temperature? L2. How do thermometers work? L3. How do objects cool? L4. What is a thermal store of energy? L5. Why are some materials good conductors? L6. Are some materials better at storing energy. **End of year OCL assessment** **Topic: Material science** L1. ceramics L2. Polymers and plastics L3. Composites