Statement of Intent- KS3 Science

"Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so we may fear less"- Marie Curie

At All Saints Academy we align our science curriculum to our vision *"Living Well Together with Dignity, Faith and Hope*". Scientific knowledge allows greater understanding of the world around us. Everything we know about the universe, from how trees reproduce to what makes up an atom, is the result of scientific research and experiment. Human progress throughout history has largely rested on advances in science -it is the greatest collaborative endeavour. Science contributes to the members of our community living well together and ensures that we have the opportunity to live a long and happy life. We use science to monitor our health, provide medicine to cure our diseases, and provide water and food for our basic needs. Science makes life more fun, including sports, music and entertainment. The latest communication technology allows us to live well together by allowing us to communicate and celebrate our faith with people on the opposite side of our ever-changing globe. We strive to ensure that students leave us scientifically literate and use these skills throughout their life when composing dignified responses to scientific concepts in the wider world. We hope that all students leave the Academy with the minimum of a grade 4 which will open the door to the best opportunities in later life.

To facilitate '*Living Well Together'* students will learn to embrace all disciplines within science; Biology, Physics and Chemistry. We will ensure students have no barriers to learning by providing all students with the opportunity to develop their investigative and practical skills within science. Students with SEND will be able to access suitably differentiated lessons which use a range of resources and techniques including audio and visual resources to aid their learning. All students will be provided with access to our online textbooks, which can be accessed from any internet enabled device, ensuring our PP students have no barriers to learning. Students will be provided with revision aids in Year 11, to provide enough resources to facilitate study within the Academy and in their own homes. During assessment there will reasonable adjustments made, for example allowing extra time and the use of student support workers.

As they commence KS3, students will extend their KS2 Physics knowledge of forces and electricity. In Biology, they will continue to develop their knowledge of the skeleton and movement, interdependence of species and plant reproduction. To reinforce the foundation of disciplinary knowledge at KS2, students will start Year 7 with a unit of 'Working Scientifically' which will develop the skills they need ahead of KS3. Students will develop these practical skills throughout their KS3 and KS4 studies as part of investigative work and core practical work. As students complete investigative work of increasing complexity, there will be a particular focus on carrying out investigations that produce reliable data. Students will be able to distinguish between reliability and precision. Throughout the

curriculum, there will be opportunities to evaluate the importance of peer review and students will appreciate the need for reproducibility in investigative work.

Generally, our main feeder schools teach the substantive content from the KS2 science curriculum, however the disciplinary knowledge is not universally well- embedded in the students' long term memory. Therefore, a proportion of the first term in Year 7, is spent ensuring all students have gained basic skills in practical science as they learn about scientific enquiry. At key stage 2, students will have been familiar with the subject of science and at key stage 3, students will develop an understanding of the clear distinction between Biology, Chemistry and Physics.

Research informed practice in STEM (Science)

The Science curriculum has disciplinary knowledge, known as working scientifically within science, at its heart in KS3 lessons. As highlighted in the Science Biology chapter in *Huh* (Mary Myatt and John Tomsett), students' weakest area from KS2 Science is 'working scientifically' due to a lack of specialist equipment at KS2. Our lessons therefore ensure that working scientific skills can be developed throughout the curriculum, not just as skills learnt in a practical, but instead working scientific skill lessons are weaved into our curriculum to teach students disciplinary practices, such as drawing graphs, validating experimental data or using a thermometer as supported by the Osted Research Framework. At KS3, topics are organised according to major scientific principles called 'Big Ideas' which are threads that run across all KS3. As stated in Ofsted's Science Research Review, 'expert pupils organise their knowledge according to major scientific principles' therefore 'pupils need their knowledge to be organised around the most important scientific concepts, which predict and explain the largest number of phenomena'. The Big Ideas covered at KS3 are Forces, Electromagnets, Energy, Waves, Matter, Reactions, Earth, Organisms, Ecosystems and Genes.

Specific support planned for SEND students:

Tasks in science are broken down into green, amber and red levels of challenge. Students are able to select an activity that is at the appropriate level, and progress on to the next stage when ready. For longer written tasks students are given a writing frame and word banks to help support SEND needs. Learning mats are used in class; these help to support students and remind them of key concepts.

Year 7

Substantive Knowledge

Students will be introduced to the topic of cells in Biology where they will gain an appreciation of the fact that all living organisms are made up of cells and the occurrence of different types of specialised cells. Students will have studied living things and their habitats and will advance their knowledge of how organisms are interdependent on one another when they live well together in the wild.

In Chemistry, students will develop knowledge of the particle model as well as being introduced to laboratory safety, investigative techniques and the difference between independent, dependent and control variables. Students will have the opportunity to use

these skills within all topics in the Science curriculum. Knowledge will be developed through using the equipment needed to separate mixtures, experiments with metals and non-metals, and acids and alkalis. Students will revisit and extend their knowledge of topics taught in KS2.
In Physics, students will revisit the topic of electricity and will develop their understanding of current, voltage and resistance. This topic links to the topic of metals and non-metals where students will develop their knowledge of the properties of metals such as conduction of electricity and heat.

Disciplinary Knowledge
Students will build upon their working scientifically skills, which will develop throughout Year 7. Students will use microscopes to study plant and animal cells. They will learn the many ways of separating mixtures from filtration to chromatography. Students will have the opportunity to use their investigative skills to construct simple series circuits as many students will not have had the opportunity to use the circuit making equipment within their primary schools. During the forces topic, they will use ramps and cars to investigate speed and forces and the factors that affect speed. Students may use data loggers to measure time. Students will be introduced to the concept of dissection during the plant reproduction topic and begin to use dissecting kits safely. The summer term will culminate in a project focusing on forensics. This will allow students to make connections and distinctions between the three sciences, as well as broadening their cultural capital.

Year 8
Substantive Knowledge
Students will expand on what they have learned in Year 7 as they continue to be taught a knowledge based curriculum, which rotates between the three sciences: Biology, Chemistry and Physics.
In Biology, students will continue building on the 'big idea of organisms' from Year 7 as they connect the topics of movement and cells with the new topics of the breathing system and digestive system. They will also extend their understanding of interdependence and how living organisms live well together as they learn about variation within species and the formation of new species. Students extend their awareness of their own health and will be considering how they can live well in terms of ensuring that they have a balanced and varied diet. They will learn about the consequences of recreational use of drugs and alcohol and the social, economic and health problems that this can cause. Students will already have an awareness from KS2 of some of the changes that they will experience as they reach puberty but they will also develop an understanding of the processes involved in human reproduction.
In Chemistry, they build on the 'big idea of matter' from Year 7, where they learned about the particle model and separating mixtures, by developing their knowledge of elements and the periodic table. Students will have studied the properties of metals and non-metals in Year 7 and will now consider these properties when they discover the position of metals and non-metals on the periodic table. Students will already have a basic understanding of the changes of state from the Year 7 programme of study. They will associate this with the rock cycle. Following this, students will investigate the properties of materials such as ceramics which uses the embedded knowledge from the metals and non-metals topic covered in Year

7. In Physics, they will continue building new knowledge as they develop their understanding of sound, light and energy transfer. Students will learn more about the human body and how the eye and ear work allowing us to use the senses studied at KS2 (sight and sound).

Disciplinary Knowledge

As part of the broad and balanced KS3 curriculum, students will learn new content through experiments which are ambitious and aim to develop their working scientifically skills, with a focus on the necessity to collect reliable and reproducible data. Students will consider how our planet has developed over time and begin to evaluate how scientists have collaborated to collect and justify evidence. Students will be introduced to the idea of peer review and this will be underpinned at several points throughout KS3 and KS4 in all of the scientific disciplines. Students will understand that many scientists from different nationalities and faiths work together to question and challenge their beliefs. Students will also be able to develop further these skills in the summer term as they learn about critiquing claims, using evidence, justifying opinions and reviewing theories. Practical science activities have huge significance in the learning process. They engage students, helping them to develop important skills, understand the process of scientific investigation and develop a broad understanding of scientific concepts. With this in mind, our curriculum seeks to offer students the opportunity to take part in as many practical science sessions as they can in all years.

Year 9

Substantive Knowledge

In Chemistry, students extend their knowledge by undertaking different types of reactions and recording the chemical energy changes. The students will have the opportunity to associate everyday reactions such as respiration, photosynthesis, self-cooling icepacks and hand warmers, to the topic of exothermic and endothermic reactions. This topic applies some of the rearranging equations knowledge from KS3 maths.

In Physics, students enhance their understanding of the 'big idea of electricity.' The students will develop understanding of the uses, advantages and disadvantages of using electromagnets. In this topic, retrieval tasks will incorporate information from Year 7 and the 'big idea of energy and waves, introduced in Year 8. Students will again evaluate the use of models within science. Students will recall the properties of waves and relate this to the properties and uses of the waves of the electromagnetic spectrum. In Year 7, students will have covered the topic of forces and will be able to state the names of a range of forces. In year 9, we build on this knowledge and look specifically at the effects of contact forces such as friction. Students will be familiar with the seven life processes, including respiration, from their work on plants, animals and cells. In Year 9, students will learn more about the processes of photosynthesis and respiration in the topic of organic energy. They will learn about the origins of the energy and how it is used by organisms. Students will already have an appreciation of how there is variation in species and survival of the fittest. In the topic of evolution, students will review the work of Charles Darwin and how his discoveries have shaped our ideas of evolution today.

At the end of Year 9, students carry out three separate working scientifically projects which are **ambitious** and challenging. The 'Science of Cooking' project will require students to recall knowledge of chemical and physical reactions. Students will have already investigated

the social implications of recreational drug use and will now investigate the use of drugs in sport and the effects on organisms. The last project in the series will draw on the knowledge from both the chemistry of materials and the laws of forces in physics.

Disciplinary Knowledge

Through their own experimentation, students will investigate and research the science behind food, the science of drugs, and engineering. These projects will stretch students, by helping them make links between the three sciences and will enrich students' awareness of the world around them, adding to their cultural capital. This is extremely important as they start thinking about their future in science and embark onto a new journey: KS4.

Students will use their knowledge of electric circuits to construct more complex electric circuits incorporating electromagnets. They will have the opportunity to formulate a hypothesis based on their prior scientific knowledge to investigate the parameters which affect the strength of their electromagnet. Students will begin to build and use models for themselves to demonstrate a range of different scenarios ranging from floating platforms to a bridge from spaghetti. They will use more complex scientific equipment to investigate the factors affecting the rate of photosynthesis and will suggest factors to change and explain how they will change these factors.

Students will design and carry out experiments to test the effect of concentration of gelatine on the amount of time it takes for jelly to set. They will design experiments to test the effect of self-raising flour / baking powder / plain flour on how much a cake rises. Students will look at chemistry of ingredients (reactants) and products when making cakes.