Biology KS5 –Statement of Intent

"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 skillset and A level grade that will open the door to the best opportunities in later life.

At key stage 5, OCR biology A level is just one of the subjects within STEM that students are offered within our sixth form. KS5 students will recognise the importance of the progress that has been made within the discipline of Biology and that they are able to contribute to the world of science both at the 'A' Level stage and beyond. We encourage our students to look towards their future prospects for post -16 education and career paths. We encourage our students to consider university: particularly, advocating course options and post-university destinations connected to the sciences.

Our two-year A-level course compliments the substantive and disciplinary knowledge fostered at KS3 and KS4. Year 12 and 13 students develop their independent practical skills by carrying out 12 practical activities which will be used to evidence each student's development of practical skills. We aim to provide our students the practical and analytical skills needed to stand out in the world of science. Explicitly explaining skills such as note taking and instructing our students to adopt the habits of independent researchers, helps set the foundation for our KS5 programme at All Saints Academy.

The Key Stage 5 Biology curriculum at All Saints Academy is inclusive to all students. All students are provided with a laptop and pupil premium students are supported within lessons. A range of multimedia is used to deliver lessons and our students are supported with practical equipment by our knowledgeable teachers and support staff.

Year 12

Substantive knowledge

Students begin the year studying the topic of cells. This builds on the knowledge from Key Stage 4 as students will increasingly understand the terms magnification and resolution. Although students will have some experience of calculating cell sizes, this will have been from data given to them during Key Stage 4 but at Key Stage 5, students will need to gather this information themselves. Students will have an understanding of the roles of the cell membranes at the perimeter of cells and at Key Stage 5, this is developed by students gaining an understanding of the structure of the cell surface membranes and how this relates to their function. Students will also have an appreciation of the roles of membranes within cells. Students will have carried out food tests including the Benedict's test at KS4 and will now investigate how the test for glucose can be made semi-quantitative through the use of the colorimeter.

The transport module looks at the roles of exchange surfaces and how a concentration gradient is maintained in various ways. Students compare the gas exchange surfaces in humans, fish and insects. Students will also learn about how water and assimilates are transported within plants. Year 12 studies culminate with an insight into disease, how organisms defend themselves against disease, and the collaborative research that takes place on a genetic level to prevent and potentially cure disease.

Disciplinary Knowledge

Students will improve their microscope skills by using eyepiece graticules and stage micrometers to measure cell and organelle lengths. Students will need to prepare and stain their own specimens for viewing under the microscope. Students will be proficient at designing experiments from GCSE and this is built upon at 'A' Level as students select from a wider range of equipment with a view to producing high quality data, which is both reproducible and reliable. At GCSE level, students will have gained an understanding of qualitative analytical techniques through experiments such as food tests. In Year 12 they will begin to use more quantitative techniques such as the use of the colorimeter to identify the glucose concentration in an unknown solution. Students will begin to use dissection kits on a more regular basis, dissecting a range of organisms such as fish, insects and mammalian organs and also plant tissues. Evidence of these activities will be provided by labelled biological drawings. One of the final activities of the year is to use molecular modelling to investigate and compare the structures of keratin (a fibrous protein) and rubisco (a globular protein) using molecular modelling.

Year 13

Substantive Knowledge

Students begin the year by learning about the biochemical pathways of respiration and photosynthesis and the inter-relationship between the processes. Respiration in particular permeates through many of the other topics studied this year especially the topic of excretion. Students will have studied nervous transmission at GCSE and will be aware of the structure of a neurone. This year, the students will learn about how the nerve cells transmit information via an action potential, and will understand how the composition of drugs may stimulate or block transmission of impulses from one neurone to another via the synapse. The hormonal communication system is the next topic to be learnt and students concentrate on the concept of negative feedback and how factors such as blood glucose level and heart rate are maintained at a constant level for homeostasis.

In the genetics topic, students will extend their knowledge of DNA and gain an understanding of how genetics leads to the control of organisms from single celled organisms, and the Lac operon, to large multicellular organisms and control based on the whole genome. Students will investigate the application of genetic techniques such as DNA profiling and genetic modification through a range of case studies. Population genetics will be studied using chi squared statistical tests and the Hardy Weinberg principle. Students will learn about food production using biotechnology and will compare and contrast batch and continuous fermentation. The course culminates in the topic of ecosystems and sustainability and students will consider their own impact on the biodiversity of our planet by discussing how we can ensure that the resources that we have currently are available for future generations.

Disciplinary Knowledge

The structure of the practical element of the course requires students to use a range of investigations in order to progress through the CPAC requirements and consistently display these skills by the end of the course. Students will calculate R_f values while investigating photosynthetic pigments. Students will use tubes to investigate the rate of respiration in yeast as part of PAG 12. This will be an investigation that they have to plan for themselves and within this planning will have to cite and reference several sources of research. They will have another opportunity to achieve this in the photosynthesis topic, where they will investigate the effect of light intensity on the rate of photosynthesis. In the neurones section, students will use human and other living subjects to collect data about factors which affect nervous transmission. In the plant responses topic, students will investigate the effects of light and gravity on the growth of seedlings. Students will become proficient in the use of statistical tests to comment on the reliability of data collected during investigations. In the final practical activities of the course, learners will use aseptic techniques and serial dilution to investigate the growth of bacteria and their resistance to antibiotics.