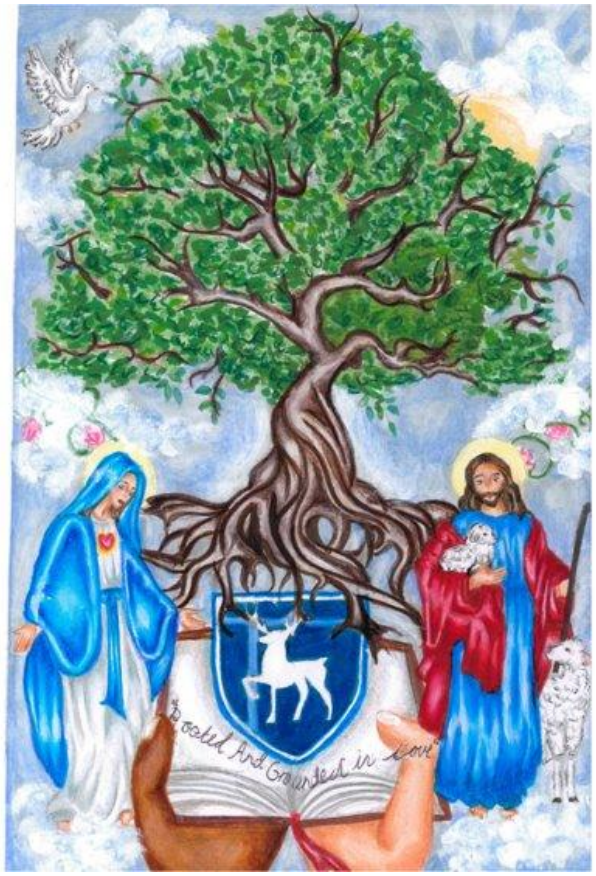
De Lisle College Curriculum

“Rooted and grounded in Love”.

Biology



Intent – 'Rooted and grounded in Love'

Intent – Rooted

Science is a body of knowledge that all students should have, so they have the power to understand the world they share and make informed decisions

Science (from the Latin word scientia, meaning "knowledge") is a is a set of ideas about the material world. The science curriculum at De Lisle aims to equip students with the knowledge and skills to apply the insights of science to the wonders of the universe.

Everything we know about the universe, from how plants reproduce to how the Universe itself came into existence, is the result of scientific research and experiment. Human progress throughout history has largely rested on advances in science. From our knowledge of gravity to the development of cutting-edge medicines, scientists have shaped our modern world for the better.

De Lisle students are surrounded by technology and the products of science every day. Government decisions that affect every aspect of our lives, both now and in the future, are based in scientific evidence. The solutions to problems facing our world, such as climate change, plastic pollution and antibiotic resistance, require the contributions of scientists. As De Lisle students grow up in an increasingly technologically and scientifically advanced world, they need to be scientifically literate to succeed.

Studying science is not just about accruing a series of facts: it is also a style of thinking. Science involves generating and testing ideas, gathering valid evidence – including by making observations, carrying out investigations and modelling, and communicating and debating with others – in order to develop scientific knowledge, understanding, and explanations. Scientific progress comes from logical, systematic work and from creative insight, built on a foundation of respect for evidence. By learning to use scientific method De Lisle students are taught how to think, learn, solve problems and make informed decisions. These skills are integral to every aspect of our students' education and life, supporting them in making an informed and positive contributions to society now and in the future.

In the Science Department we work to inform, enthuse and inspire our students.

Biology

Year 12

De Lisle College
A Catholic Voluntary Academy

Curriculum Outline

Link to Catholic Social Teaching:

- Dignity – study of health, disease and risk factors looks at the importance of human health and the value of every human life. We look at the ethics of using stem cells and discuss the role of genetic testing in society.
- The common good – drug development and antibiotic resistance look at the provision of medical care to all.
- Steward ship – The study of seed banks and conservation efforts along with the impacts of climate change look at the responsibilities of humans to are for our shared home. Biodiversity and conservation highlight humanity's responsibility to protect creation. Sustainable use of natural resources reflects the Catholic belief that creation is entrusted to humanity's care rather than exploitation.

Advent 1	Lifestyle, health & risk	**Advent 2**	Genes & health & cell structure
Description	• This topic looks at the structure and functioning of the circulatory system and the importance of lifestyle choices to health, including blood clotting and the formation of atheroma's. • The role of diet and other lifestyle factors in maintenance of good health in reference to the heart and circulation and to cardiovascular disease (CVD). Including energy budgets and BMI. • An overview of the main biological molecules is covered to include the structures and functions of some carbohydrates and lipids. To include starch, glycogen, triglycerides and HDL and LDL. • Ideas about correlation, causation and the concept of risks to health are also covered.	Description	• This topic looks at some of the major biological principles through the context of the genetic disease cystic fibrosis. • The Structure and properties of cell membranes and transport of materials, across cell membranes and gas exchange surfaces, • The structure of DNA and how it is replicated, • The processes of protein synthesis to include transcription and translation. • Proteins structure and folding to include the role and function of enzymes. • The inheritance of disease by monohybrid inheritance and the social and ethical issues surrounding screening for genetic conditions. • The ultrastructure of both animal and bacterial cells.

Lent 1	Development, inheritance & biodiversity	**Lent 2**	Natural resources
Description	• This topic follows the development of multicellular organisms from single cells to complex individuals. • The processes of the cell cycle and how cells divide including both mitosis and meiosis, • The processes of fertilisation including the acrosome and cortical reactions. • The roles of stem cells, gene expression, cell differentiation and tissue organisation, including differential gene expression and a study of epigenetics.	Description	• The topic focuses on biodiversity and the wealth of natural resources used by humans. • This includes the species concept and niches alongside the different types of adaptation. • We also study biodiversity and how this has come about through adaptation and natural selection and how this leads to evolution. • We study both the traditional and novel uses of plants and plant fibres and the use of chemical extracts from animals and plants to include drugs and the protocols for testing new drugs. • We study the ultrastructure of plant cells with a focus on the structure and role of cellulose. • The topic concludes with the issue of sustainability and the role of zoos and seed banks in the conservation of endangered species.
Pentecost 1	Ecosystems and climate change	**Pentecost 2**	Photosynthesis
Description	• This topic introduces the study of ecology and looks at ecosystem development and succession. • The topic continues by looking at the causes of climate change, the evidence that our climate is changing and the consequences of this change. • We then look at if the effects will lead to the extinction of species or evolution by natural selection and look at the effects on plants and animals. • By the end of the topic students should appreciate how scientific understanding can make us aware of our responsibilities as stewards of the environment.	Description	• This topic looks the complex chemical pathway that is photosynthesis. • This includes details of the light dependent and light independent reactions and the structure and adaptations of chloroplasts. • Students will also have the opportunity to carry out sampling work to study an area of special scientific interest in the Peak District national park.

Biology

Year 13

De Lisle College
A Catholic Voluntary Academy

Curriculum Outline

Link to Catholic Social Teaching:

- Dignity - The study of disease, infection and immunity highlights the value of human life and the importance of protecting health. Forensic science demonstrates the pursuit of truth and justice, supporting the dignity of victims and their families. DNA profiling can lead to discussions about privacy, ethics and the responsible use of biological information.
- Option for the poor - HIV and tuberculosis provide opportunities to discuss global health inequalities and society's obligation to care for vulnerable populations.
- The common good - Understanding antibiotic resistance raises questions about responsible use of medicines and our duty to protect future generations. Studying Parkinsons disease and depression and the new treatments for this emphasise the Church's desire to support the dignity and wellbeing of every person.

Advent 1	Immunity, infection and forensics	**Advent 2**	Muscles and respiration
Description	• This topic starts by looking at how forensic pathologists use a wide variety of analytical techniques to determine identity and the time and cause of death of an organism, including humans. This includes DNA profiling and gel electrophoresis. • We then consider how bacteria and viruses use a variety of routes into their hosts and how hosts have evolved barriers and internal mechanisms to combat infections. This includes a detailed study of the pathogens that cause HIV and TB and the effect that these have on the body. • We study the immune system in detail to include the mechanisms of the non-specific immune system such as phagocytosis and inflammation. We then study the processes of the specific immune system including both the B and T cell responses. • The topic ends by looking antibiotics and the development of hospital acquired infections, their prevention and control.	Description	• This topic is centred on the physiological adaptations that enable animals and humans, particularly sports people, to undertake strenuous exercise. • We study the structure and function of muscles and the process of muscle contraction. • We also consider the control of heart rate, and the control of ventilation linked explicitly to exercise. As well as how electrical activity of the heart is controlled and monitored. • The topic summarises the biochemical processes involved in both aerobic and anaerobic respiration. • The topic ends by considering the processes of temperature regulation and by looking at how medical technology is enabling more people to participate in sport and raising the issue of whether the use of performance-enhancing substances by athletes can be justified.

Lent 1	Brain and nervous system	**Lent 2**	Review & consolidate
Description	• Our final topic studies the brain and nervous system. Starting by considering the structures and mechanism of action of nerves and synapses. • We then look at the role of rod cells in enabling us to see, and the development of vision and learning. • We also study methods of brain imaging such as MRI and PET scans and consider the structure and function of the brain. • We also look at how imbalances in brain chemicals may result in conditions such as Parkinson's disease and depression, which can be treated with suitable drugs.	Description	• During this term students will begin a bespoke review program that recovers all of the specification points from the course. The order of review lessons is determined by the question level analysis of the students' mock exams.
Pentecost 1	Review & consolidate	**Pentecost 2**	COURSE COMPLETED
Description	• Students will complete the review program to include looking at exam technique, the core practical questions and writing 9 marks answers. • We will also study the pre-release in preparation for the Paper 3 examination.	Description	