



## Course Outline

### Biology AS(Edexcel)

*Inspiring excellence, empowering global minds*

#### Overview

The KS5 A level Biology Syllabus at GEMS Wesgreen International Secondary School is typically designed to provide students with an in-depth understanding of biological concepts and principles at an advanced level. The syllabus aims to support students by developing their critical thinking, practical Skills and relevance to real world issues. These skills are essential for both further studies and scientific careers.

#### Learning Outcomes

The aims are to :

- develop and use a range of mathematical skills that support their knowledge and understanding of their subject
- gain experience in a variety of practical techniques and procedures, which will be assessed separately in Unit 3 and Unit 6
- widen their learning through a number of key transferable skills, which may be cognitive, intrapersonal or interpersonal

#### Chapter Overviews

##### Term 1

**Unit 1: Molecules, Transport and Health**

**Approximate length: 35 hours**

##### Topic 1A

- the importance of water as a solvent
- the difference between monosaccharides, disaccharides, polysaccharides, including glycogen and starch (amylose and amylopectin)
- how a triglyceride is synthesised
- why many animals have a heart and circulation

##### Topic 1B

- the cardiac cycle
- the structure and operation of the mammalian heart, including the major blood vessels, to its function
- the role of haemoglobin in the transport of oxygen and carbon dioxide
- the oxygen dissociation curve of haemoglobin, the Bohr effect and the significance of the oxygen affinity of fetal haemoglobin compared with adult haemoglobin
- the blood clotting process and the course of events that leads to atherosclerosis

**Topic 1C**

- how factors such as genetics, diet, age, gender, high blood pressure, smoking and inactivity increase the risk of cardiovascular disease (CVD)
- the link between dietary antioxidants and the risk of cardiovascular disease (CVD)
- analyse data on the possible significance for health of blood cholesterol levels and levels of high-density lipoproteins (HDLs) and low-density lipoproteins (LDLs)
- the benefits and risks of treatments for cardiovascular disease (CVD) (antihypertensives, statins, anticoagulants and platelet inhibitors)

**Unit 2: Membranes, proteins, DNA and gene expression****Approximate length: 25 hours****Topic 2A**

- the properties of gas exchange surfaces in living organisms (large surface area to volume ratio, thickness of surface and difference in concentration)
- know the structure and properties of cell membranes how models such as the fluid mosaic model of membrane
- structure are interpretations of data used to develop scientific explanations of the structure and properties of cell membranes
- the involvement of carrier and channel proteins in membrane transport

**Topic 2B**

- know the basic structure of an amino acid the formation of polypeptides and proteins (amino acid monomers linked by condensation reactions to form peptide bonds)
- the significance of a protein's primary structure in determining its secondary structure, three-dimensional structure
- and properties (globular and fibrous proteins and the types of bonds involved in its three-dimensional structure)
- The mechanism of action and the specificity of enzymes in terms of their three-dimensional structure
- enzymes are biological catalysts that reduce activation energy
- there are intracellular enzymes catalysing reactions inside cells and extracellular enzymes catalysing reactions outside cells

**Topic 2C**

- the process of DNA replication, including the role of DNA polymerase how Meselson and Stahl's classic experiment provided new data that supported the accepted theory of replication of DNA and refuted competing theories
- the nature of the genetic code (triplet code, non-overlapping and degenerate) the process of protein synthesis (transcription and translation),
- including the role of RNA polymerase, translation, messenger RNA, transfer RNA, ribosomes and the role of start and stop codons
- how the expression of a gene mutation in people with cystic fibrosis impairs the functioning of the gaseous exchange, digestive and reproductive systems
- the uses of genetic screening, including the identification of carriers, pre-implantation genetic diagnosis (PGD) and prenatal testing, including amniocentesis and chorionic villus sampling

## Term 2

### Unit 2: Cells, Development, Biodiversity and Conservation

#### Topic 3: Cell structure, Reproduction and Development

Approximate length: 30 hours

##### Topic 3A

- the ultrastructure of eukaryotic cells, including nucleus, nucleolus, ribosomes, rough and smooth endoplasmic reticulum, mitochondria, centrioles, lysosomes and Golgi apparatus, and the function of these organelles

## Term 3

#### Topic 3: Cell structure, Reproduction and Development

Approximate length: 15 hours

##### Topic 3B

- the role of mitosis and the cell cycle in producing genetically identical daughter cells for growth and asexual reproduction
- the process of fertilisation in mammals, including the acrosome reaction, the cortical reaction and the fusion of nuclei
- the process of fertilisation in flowering plants, starting with the growth of a pollen tube and ending with the fusion of nuclei what is meant by the terms stem cell, pluripotent and totipotent, morula and blastocyst

discuss the ways in which society uses scientific knowledge to make decisions about the use of stem cells in medical therapies

##### Topic 3C

- how cells become specialised through differential gene expression, producing active mRNA, leading to the synthesis of proteins which, in turn, control cell processes or determine cell structure in animals and plants

### AS revision

## Assessment

**Formative:** Throughout the topics, the students will complete end of chapter assessments, quizzes and problem-solving activities which will allow the teacher to assess the students' progress and inform their planning.

**Summative:** At the end of Term 1, students will sit for the Mock 1 examinations.