Meridian Trust

GCSE Biology:

Curriculum Overview

Unit order	Rationale for Sequence	Disciplinary knowledge map	Lessons in sequence
B1	Introduces the key differences between plant and animal cells and why they have specific sub-cellular structures. Introduces bacteria and culturing microorganisms Identifies cell specialisation/differentiation and the idea of surface area and surface area to volume ratio to base later ideas on Key principles of diffusion/osmosis and active transport introduced. Introduces maths concepts of converting between units and standard form. Introduces mitosis and basic cell division to build on later for meiosis.	• Uses of microscopes – key ideas of resolution and magnification + procedural use of scope • Cells required practical - why we stain, health and safety • Calculating simple magnification/ calculating image size/actual size. Magnification using standard equation. • Changing between units/standard form • DNA discovery – Peer review / development of knowledge • Bacteria required practical – Health and safety, sterile technique and key points for growing/ calculating area of a circle for zones of inhibition/ conclusion and evaluation/ errors in data. • Diffusion/osmosis/active transport – concentration gradients • Osmosis required practical - accuracy and reliability, why calculate percentage change in mass. Safety. • Graph skills as positive and negative data/where isotonic point is and what it tells you. • Conclusion and evaluation. • Mitosis – why cells need to be identical and how this happens and how different to binary fission.	L1: Cells and their sub-cellular structures L2: Specialised cells L3: Magnification L4: RP: Magnification L5: DNA and chromosomes L6: bacterial division (Biology only) L7: RP: culturing microbes (biology only) L8: mid-point assessment L9: mitosis L10: Stem cells L11: Diffusion L12: Osmosis L13: RP: Osmosis L14: Active transport
B2	Builds upon the fundamental concepts covered in B1 such as exchange surfaces, diffusion, osmosis and active transport and relates to tissues and specific organs in animals and plants.	• L2 Rp Food tests – Hazards and precautions. Writing methods. Qualitative data • L4a Rp Following methods, variables, collecting data • L4b Rp: Calculating rate. Reproducibility, graph drawing, describing and explaining graphs • L9: Evaluation of different treatments.	L1:Priciples of organisation L2:RP Food Tests L3:Enzymes L4a:RP Investigating Enzymes L4b: RP Processing data L5a: Digestive Enzymes

	Links B1 and B3 by linking concepts of cells and impact of disease to specific organs of organisms and/or organelles.	• L14: Independent, dependent and control variables	L5b: Digestion and absorption L6:The Lungs (exchange surfaces) L7:Circulation – The blood vessels and blood L8:Circulation – The heart L9: Coronary Heart Disease L10:Risk Factors – Non-Communicable Diseases L11: Cancer L12: Plant Cells Organisation L13: Transpiration L14: The rate of Transpiration
B3	Links to B1 using microbiology to understand the use of antibiotics and their effectiveness. Explaining causes, symptoms and how to treat disease and how to reduce the spread of disease.	• Methods of preventing spread of infection • Explain how diseases are caused and spread and how symptoms develop • Explain the role of the immune system in defence against disease • Explain how vaccination prevent illness and how the spread of pathogens can be reduced • Treatment of disease • Describe the process of discovery and development of disease • Describe how monoclonal antibodies work and their uses • Identifying plant disease and how plants defend themselves from disease	L1: Causes of infectious disease L2: Diseases spread by water and air L3: Diseases spread by contact and vectors L4: Other ways diseases are spread L5: Non-specific defences L6: The immune system L7: Vaccinations and Immunity L8: Antibiotics L9: Mid Topic Assessment L10: Painkillers, drug testing and drug development L11: Monoclonal antibodies (Separate Science only) L12: Detection of plant disease (Separate Science only) L13: Plant defence responses (Separate Science only)
B4	Requires an understanding of plant leaf structure and transport B2 Organisation	Investigating the rate of photosynthesis • Variables	L1: Photosynthesis L2: Testing a leaf for starch L3: Rate of photosynthesis

	- Respiration requires an understanding of cell structure B1 Cell biology - Photosynthesis and respiration links to rates of reaction C6 possibility of tangents	• Measurements - gas syringe/bubbles/resolution/reproducibility • Math skill - Inverse square law/rates(tangents) • Graphing skills • Suggesting improvements • Calculating means • Interpreting data – limiting factors • Analysing data – exercise graphs/photosynthesis graphs • Evaluating - Limiting factors/greenhouse activities	L4: RP: Photosynthesis L5:Green houses L6 Uses of Glucose L7: Aerobic respiration L8: Anaerobic respiration L9: Exercise L10: Metabolism
B5	• Beginning of Paper 2. Development and application of concepts learned in paper 1 topics. • Links to KS2 and 3 curriculum in extending the concept that living organisms are sensitive to stimuli in their environment (MRS GREN) to develop the concept of homeostasis. • Builds upon concept of specialised cells (e.g. neurones) from B1 and combines with levels of organisation from B2 to build understanding of the nervous and endocrine systems. • Regulation of blood glucose and removing waste products links back to B2 and the blood as a transport system around the body as well as the concept that starch is a polymer made of simple sugars (glucose) which are soluble. This also builds upon knowledge of respiration from B4 in which glucose is a product. • The kidneys requires understanding of transport in cells from B1 and treatments	• Nervous system (reaction times practical) – identifying variables, maths skills (calculating mean), identifying type of graph based on dataset, drawing bar charts, drawing conclusions, suggesting improvements for accuracy and precision • Diabetes – interpreting data from a graph • Kidney failure – identifying disadvantages and evaluating treatments • Hormones and the menstrual cycle – interpreting graphical data and applying substantive knowledge (graph of hormone levels – identifying which hormone each line represents) • Contraception – evaluation of new concept in comparison to learned knowledge (new contraceptive technique vs. techniques taught) • Infertility – drawing conclusions from data • Plant hormones RP – variables, designing suitable practical activities • Plant hormones RP analysis – maths skills (calculating mean), identifying type of graph based on dataset, drawing bar charts, drawing conclusions, evaluating and improving methods	L1: Homeostasis and controlling body temperature L2: The nervous system (RP- reaction times) L3: Reflexes L4: The brain (Separate Science) L5: The eye (Separate Science) L6: Correcting vision defects (Separate Science) L7: The endocrine system L8: Controlling blood glucose L9: Diabetes L10: Negative feedback (HT only) L11: Removing waste products (Separate Science) L12: The kidney (Separate Science) L13: Kidney failure (Separate Science) L14: Hormones and the menstrual cycle L15: Contraception L16: Infertility (HT only) L17: Plant hormones (Separate Science)

	for kidney failure requires an understanding of rejection of organ transplants and antigens linking to both B2 (non-communicable diseases) and B3. • The menstrual cycle and contraception both require prior knowledge of the reproductive organs and reproduction from KS3. • Plant hormones builds upon understanding of specialised plant cells (root hair cells) from B1, plant organisation from B2 and photosynthesis from B4. • Required practicals require prior disciplinary knowledge which is further developed, identifying variables and developing scientific method.		L18: RP: Plant hormones (Separate Science) L19: Plant hormones – practical analysis (Separate Science)
B6	Builds on understanding of genetic material covered in B1. It is important to understand natural selection (adaptation) to be able to fully understand ecology and species distribution. An understanding of genetics helps to understand types of biodiversity in B7.	• Discovery of DNA – scientific process (Watson Crick and Franklin) • Mutation in DNA may be silent, positive or negative. • Genetic crosses are predictions of outcome and those presented are simple examples • Inherited condition art the result of mutation and those mutations may be different • Genetic screening may lead to outcomes which can be morally problematic • Natural selection and speciation utilise fossils and other sources as evidence. • B6 : Builds on previous conceptual learning. Requires Mitosis from B1. Requires knowledge of bacteria and DNA and mutations for evolution and speciation.	L1: Sexual and asexual reproduction L2: Mitosis and Meiosis L3: DNA structure L4: translation L5: Inheritance L6: History of Genetics L7: Inherited disorders L8: Genetic Screening L9: Variation L10: Theories of evolution L11: Theory of evolution II L12: Selective breeding and cloning L13: Evidence for evolution L14: Speciation L15: Classification

B7	Builds upon knowledge from B1-6, requires knowledge from previous learning to be able to access content.	How to calculate area, mean, mode and median. Use transects, use quadrate, calculate %, record length. Apply correct technique to investigate distribution and abundance. Plan investigation. Estimate populations. Plot and draw graphs using appropriate scale for axis, using multiple variables on the Y-axis. Following methods. How to use a random number generator, how to use grid references. Interpreting model, Extracting/interpreting data from graphs, Evaluating/analysing data. Using representative data/evaluating representative data.	L1: The importance of communities L2: Abiotic and biotic factors L3: Distribution and abundance L4: RP: Ecology L5: Adaptations L6: Levels of organisation L7: Material cycling L8: Decomposition L9: RP: decay L10: Impact of environmental change L11: Biodiversity L12: Waste management L13: Land use and deforestation L14: Global warming L15: Preserving biodiversity L16: Trophic levels and biomass L17: Biomass transfers L18: Factors affecting food security L19: Sustainable food production