Jeannine Manuel School
International understanding through a bilingual education

Scheme of Work - IBDP Biology

AUTUMN 1

A1.1 Water
Unity and diversity—Molecules
Standard level and higher level: 2 hours
Additional higher level: 1 hour

- What physical and chemical properties of water make it essential for life?
- What are the challenges and opportunities of water as a habitat?

A1.2 Nucleic acids
Unity and diversity—Molecules
Standard level and higher level: 3 hours

- How does the structure of nucleic acids allow hereditary information to be stored?
- How does the structure of DNA facilitate accurate replication?

A2.1 Origins of cells
Unity and diversity—Cells
Additional higher level: 2 hours

- What plausible hypothesis could account for the origin of life?
- What intermediate stages could there have been between non-living matter and the first living cells?

A2.2 Cell structure
Unity and diversity—Cells
Standard level and higher level: 4 hours
Additional higher level: 1 hour

- What are the features common to all cells and the features that differ?
- How is microscopy used to investigate cell structure?

A2.3 Viruses
Unity and diversity—Cells
Additional higher level: 2 hours

- How can viruses exist with so few genes?
- In what ways do viruses vary?

AUTUMN 2

A3.1 Diversity of organisms
Unity and diversity—Organisms
Standard level and higher level: 3 hours
Additional higher level: 2 hours

- What is a species?
- What patterns are seen in the diversity of genomes within and between species?

A3.2 Classification and cladistics
Unity and diversity—Organisms
Additional higher level: 3 hours

- What tools are used to classify organisms into taxonomic groups?
- How do cladistic methods differ from traditional taxonomic methods?

A4.1 Evolution and speciation
Unity and diversity—Ecosystems
Standard level and higher level: 4 hours
Additional higher level: 1 hour

- What is the evidence for evolution?
- How do analogous and homologous structures exemplify commonality and diversity?

A4.2 Conservation of biodiversity
Unity and diversity—Ecosystems
Standard level and higher level: 3 hours

- What factors are causing the sixth mass extinction of species?
- How can conservationists minimise the loss of biodiversity?

B1.1 Carbohydrates and lipids
Form and function—Molecules
Standard level and higher level: 4 hours

- In what ways do variations in form allow diversity of function in carbohydrates and lipids?
- How do carbohydrates and lipids compare as energy storage compounds?

SPRING 1

B1.2 Proteins
Form and function—Molecules
Standard level and higher level: 2 hours
Additional higher level: 2 hours

• What is the relationship between amino acid sequence and the diversity in form and function of proteins?
• How are protein molecules affected by their chemical and physical environments?

B2.1 Membranes and membrane transport
Form and function—Cells
Standard level and higher level: 4 hours
Additional higher level: 2 hours

• How do molecules of lipid and protein assemble into biological membranes?
• What determines whether a substance can pass through a biological membrane?

B2.2 Organelles and compartmentalization
Form and function—Cells
Standard level and higher level: 1 hour
Additional higher level: 2 hours

• How are organelles in cells adapted to their functions?
• What are the advantages of compartmentalization in cells?

B2.3 Cell specialisation
Form and function—Cells
Standard level and higher level: 2 hours

• What are the roles of stem cells in multicellular organisms?
• How are differentiated cells adapted to their specialised functions?

B3.1 Gas exchange
Form and function—Organisms
Standard level and higher level: 3 hours
Additional higher level: 1 hour

• How are multicellular organisms adapted to carry out gas exchange?
• What are the similarities and differences in gas exchange between a flowering plant and a mammal?

SPRING 2

B3.2 Transport
Form and function—Organisms
Standard level and higher level: 3 hours
Additional higher level: 2 hours

- What adaptations facilitate transport of fluids in animals and plants?
- What are the differences and similarities between transport in animals and plants?

B3.3 Muscle and motility
Form and function—Organisms
Additional higher level: 3 hours

- How do muscles contract and cause movement?
- What are the benefits to animals of having muscle tissue?

B4.1 Adaptation to environment
Form and function—Ecosystems
Standard level and higher level: 3 hours

- How are the adaptations and habitats of species related?
- What causes the similarities between ecosystems within a terrestrial biome?

B4.2 Ecological niches
Form and function—Ecosystems
Standard level and higher level: 4 hours

- What are the advantages of specialised modes of nutrition to living organisms?

C1.1 Enzymes and metabolism
Interaction and interdependence—Molecules
Standard level and higher level: 3 hours
Additional higher level: 2 hours

- In what ways do enzymes interact with other molecules?
- What are the interdependent components of metabolism?

SUMMER 1

C1.2 Cell respiration
Interaction and interdependence—Molecules
Standard level and higher level: 2 hours
Additional higher level: 3 hours

• What are the roles of hydrogen and oxygen in the release of energy in cells?
• How is energy distributed and used inside cells?

C1.3 Photosynthesis
Interaction and interdependence—Molecules
Standard level and higher level: 3 hours

• How is energy from sunlight absorbed and used in photosynthesis?
• How do abiotic factors interact with photosynthesis?

C2.1 Chemical signalling
Interaction and interdependence—Cells
Additional higher level: 4 hours

• How do cells distinguish between the many different signals that they receive?
• What interactions occur inside animal cells in response to chemical signals?

C2.2 Neural signalling
Interaction and interdependence—Cells
Standard level and higher level: 3 hours
Additional higher level: 3 hours

Guiding questions
• How are electrical signals generated and moved within neurons?
• How can neurons interact with other cells?

C3.1 Integration of body systems
Interaction and interdependence—Organisms
Standard level and higher level: 5 hours
Additional higher level: 2 hours

• What are the roles of nerves and hormones in integration of body systems?
• What are the roles of feedback mechanisms in regulation of body systems?

SUMMER 2

C3.2 Defence against disease
Interaction and interdependence—Organisms
Standard level and higher level: 5 hours

- How do body systems recognize pathogens and fight infections?
- What factors influence the incidence of disease in populations?

C4.1 Populations and communities
Interaction and interdependence—Ecosystems
Standard level and higher level: 5 hours

Guiding questions
- How do interactions between organisms regulate sizes of populations in a community?
- What interactions within a community make its populations interdependent?

C4.2 Transfers of energy and matter
Interaction and interdependence—Ecosystems
Standard level and higher level: 5 hours

- What is the reason matter can be recycled in ecosystems but energy cannot?
- How is the energy that is lost by each group of organisms in an ecosystem replaced?

AUTUMN 1

D1.1 DNA replication
Continuity and change—Molecules
Standard level and higher level: 2 hours
Additional higher level: 2 hours

Guiding questions
• How is new DNA produced?
• How has knowledge of DNA replication enabled applications in biotechnology?

D1.2 Protein synthesis
Continuity and change—Molecules
Standard level and higher level: 3 hours
Additional higher level: 3 hours

• How does a cell produce a sequence of amino acids from a sequence of DNA bases?
• How is the reliability of protein synthesis ensured?

D1.3 Mutation and gene editing
Continuity and change—Molecules
Standard level and higher level: 3 hours
Additional higher level: 2 hours

• How do gene mutations occur?
• What are the consequences of gene mutation?

D2.1 Cell and nuclear division
Continuity and change—Cells
Standard level and higher level: 3 hours
Additional higher level: 1 hour

• How can large numbers of genetically identical cells be produced?
• How do eukaryotes produce genetically varied cells that can develop into gametes?

AUTUMN 2

D2.2 Gene expression
Continuity and change—Cells
Additional higher level: 3 hours

- How is gene expression changed in a cell?
- How can patterns of gene expression be conserved through inheritance?

D2.3 Water potential
Continuity and change—Cells
Standard level and higher level: 2 hours
Additional higher level: 2 hours

- What factors affect the movement of water into or out of cells?
- How do plant and animal cells differ in their regulation of water movement?

D3.1 Reproduction
Continuity and change—Organisms
Standard level and higher level: 5 hours
Additional higher level: 3 hours

- How does asexual or sexual reproduction exemplify themes of change or continuity?
- What changes within organisms are required for reproduction?

D3.2 Inheritance
Continuity and change—Organisms
Standard level and higher level: 5 hours
Additional higher level: 3 hours

- What patterns of inheritance exist in plants and animals?
- What is the molecular basis of inheritance patterns?

SPRING 1

D3.3 Homeostasis
Continuity and change—Organisms
Standard level and higher level: 2 hours
Additional higher level: 2 hours

- How are constant internal conditions maintained in humans?
- What are the benefits to organisms of maintaining constant internal conditions?

D4.1 Natural selection
Continuity and change—Ecosystems
Standard level and higher level: 2 hours
Additional higher level: 2 hours

- What processes can cause changes in allele frequencies within a population?
- What is the role of reproduction in the process of natural selection?

D4.2 Stability and change
Continuity and change—Ecosystems
Standard level and higher level: 4 hours
Additional higher level: 2 hours

- What features of ecosystems allow stability over unlimited time periods?
- What changes caused by humans threaten the stability of ecosystems?

D4.3 Climate change
Continuity and change—Ecosystems
Standard level and higher level: 3 hours
Additional higher level: 1 hour

- What are the drivers of climate change?
- What are the impacts of climate change on ecosystems?