



Biology– Course Curriculum Plan

Programme Duration: 36 Weeks



PEFA Academy A Level Biology Curriculum

PROGRAMME OVERVIEW

The A Level Biology programme is designed to provide students with a comprehensive understanding of living organisms and biological processes, from the molecular level to complex ecosystems. The programme develops scientific knowledge, investigative skills, analytical thinking, and practical laboratory competence required for higher education and careers in medicine, health sciences, biotechnology, agriculture, environmental science, research, and related fields. The curriculum emphasizes scientific inquiry, critical thinking, experimentation, and the application of biological principles to real-world situations.



Learning Approach & Course Structure

Students will explore the structure and function of living systems, inheritance, evolution, ecology, and modern biological technologies.

Learning Approach

PEFA Academy adopts a flexible and student-centred learning approach designed to help students develop a thorough understanding of biological concepts while preparing effectively for advanced-level examinations. The programme incorporates:

- Live Online Classes
- Recorded Lessons
- Interactive Discussions
- Practical Laboratory Activities
- Scientific Investigations
- Examination-Style Questions
- Weekly Assignments
- Topic-Based Assessments
- Mock Examinations
- Past Question Practice
- Tutor Support Sessions



Course Structure

The curriculum is divided into sixteen major learning areas.

01

Module 1: Cell Structure

02

Module 2: Biological Molecules

03

Module 3: Enzymes

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Module 4: Cell Membranes and Transport

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Module 5: The Mitotic Cell Cycle

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Module 6: Nucleic Acids and Protein Synthesis

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Module 7: Transport in Plants

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Module 8: Transport in Mammals

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Module 9: Gas Exchange

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Module 10: Infectious Diseases

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Module 11: Immunity

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Module 12: Energy and Respiration

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Module 13: Photosynthesis

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Module 14: Homeostasis

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Module 15: Control and Coordination

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Module 16: Inheritance

Modules 1–4: Foundations of Cell Biology

Module 1: Cell Structure

This module introduces cells as the fundamental units of life and explores the structure and functions of cellular components.

Topics Covered

- Microscopy and cell studies
- Cell ultrastructure
- Prokaryotic and eukaryotic cells
- Plant and animal cells
- Viruses and their structure

Learning Outcomes

Students should be able to:

- Use microscopes effectively
- Identify cell organelles and their functions
- Compare prokaryotic and eukaryotic cells
- Distinguish between plant and animal cells
- Explain the structure of viruses

Module 2: Biological Molecules

This module explores the chemical basis of life and the relationship between molecular structure and biological function.

Topics Covered

- Carbohydrates
- Lipids
- Proteins
- Water and its biological importance
- Biochemical testing

Learning Outcomes

Students should be able to:

- Describe biological molecules and their functions
- Conduct food and biochemical tests
- Relate molecular structure to function
- Explain the importance of water in living organisms

Module 3: Enzymes

This module examines enzymes as biological catalysts and investigates factors affecting enzyme activity.

Topics Covered

- Enzyme structure
- Mode of enzyme action
- Factors affecting enzyme activity
- Enzyme inhibition
- Immobilised enzymes

Learning Outcomes

Students should be able to:

- Explain how enzymes function
- Investigate enzyme-catalysed reactions
- Analyse factors affecting enzyme activity
- Evaluate industrial applications of enzymes

Module 4: Cell Membranes and Transport

This module explores membrane structure and the movement of substances into and out of cells.

Topics Covered

- Fluid mosaic model
- Membrane components
- Diffusion
- Osmosis
- Active transport
- Endocytosis and exocytosis

Learning Outcomes

Students should be able to:

- Describe membrane structure
- Explain transport mechanisms
- Investigate osmosis and diffusion
- Relate membrane structure to function

Modules 5–7: Genetics, Cell Division & Plant Transport

Module 5: The Mitotic Cell Cycle

This module focuses on cell division, growth, tissue repair, and cancer development.

Topics Covered

- Chromosome structure
- Cell cycle
- DNA replication
- Mitosis
- Stem cells
- Tumour formation

Learning Outcomes

Students should be able to:

- Explain the stages of mitosis
- Describe chromosome behaviour
- Understand tissue repair processes
- Explain the causes of uncontrolled cell division

Module 6: Nucleic Acids and Protein Synthesis

This module investigates genetic material and the processes involved in protein production.

Topics Covered

- DNA structure
- RNA structure
- DNA replication
- Genetic code
- Transcription
- Translation
- Gene mutations

Learning Outcomes

Students should be able to:

- Describe the structure of nucleic acids
- Explain DNA replication
- Interpret the genetic code
- Explain protein synthesis
- Evaluate the effects of mutations

Module 7: Transport in Plants

Topics Covered

- Xylem and phloem
- Water transport
- Transpiration
- Translocation
- Xerophytic adaptations

Learning Outcomes

Students should be able to:

- Describe plant transport tissues
- Explain water movement through plants
- Analyse factors affecting transpiration
- Explain translocation mechanisms



Modules 8–10: Transport, Gas Exchange & Infectious Diseases

Module 8: Transport in Mammals

Topics Covered

- Circulatory system
- Blood vessels
- Blood components
- Oxygen transport
- Carbon dioxide transport
- Heart structure and function

Learning Outcomes

Students should be able to:

- Describe the mammalian circulatory system
- Explain gas transport in blood
- Analyse heart function
- Relate structure to function in blood vessels

Module 9: Gas Exchange

Topics Covered

- Human respiratory system
- Alveoli and gas exchange
- Lung structure
- Adaptations for efficient gas exchange

Learning Outcomes

Students should be able to:

- Describe respiratory structures
- Explain gaseous exchange
- Relate structure to respiratory function
- Analyse respiratory adaptations

Module 10: Infectious Diseases

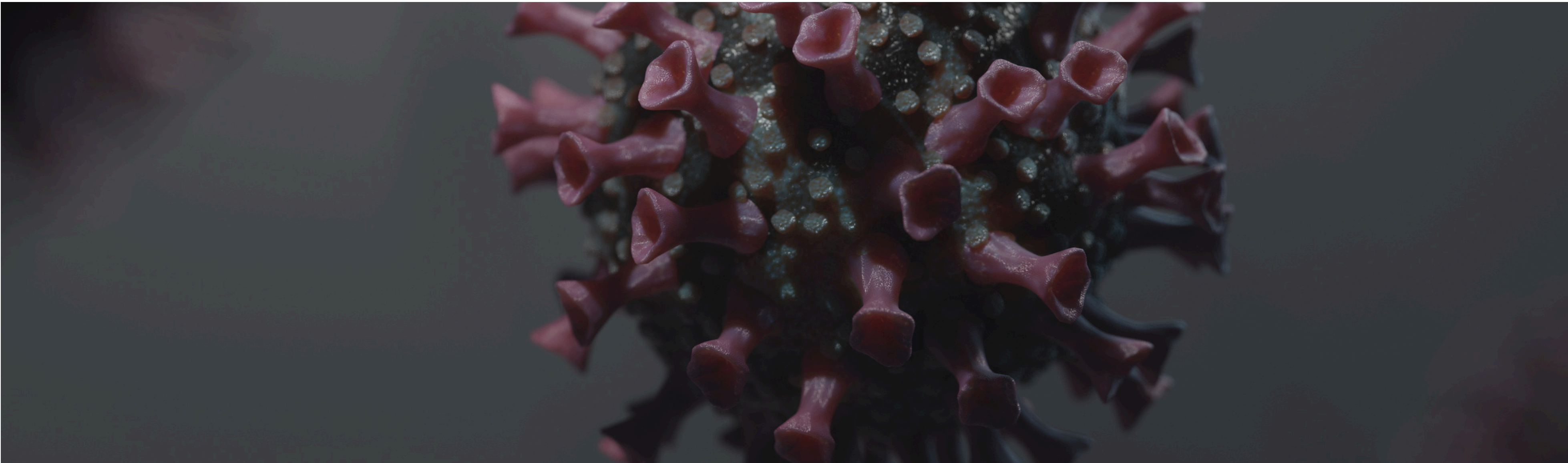
Topics Covered

- Cholera
- Malaria
- Tuberculosis
- HIV/AIDS
- Disease transmission
- Antibiotics and resistance

Learning Outcomes

Students should be able to:

- Identify major infectious diseases
- Explain disease transmission
- Evaluate disease control measures
- Discuss antibiotic resistance



Modules 11–13: Immunity, Energy & Photosynthesis

Module 11: Immunity

Topics Covered

- Immune system
- Phagocytosis
- Antibodies
- Vaccination
- Monoclonal antibodies
- Active and passive immunity

Learning Outcomes

Students should be able to:

- Explain immune responses
- Describe antibody functions
- Differentiate types of immunity
- Evaluate vaccination programmes

Module 12: Energy and Respiration

Topics Covered

- ATP
- Aerobic respiration
- Anaerobic respiration
- Krebs cycle
- Oxidative phosphorylation
- Respiratory quotient

Learning Outcomes

Students should be able to:

- Explain energy transfer in living organisms
- Describe stages of respiration
- Analyse respiration data
- Investigate factors affecting respiration

Module 13: Photosynthesis

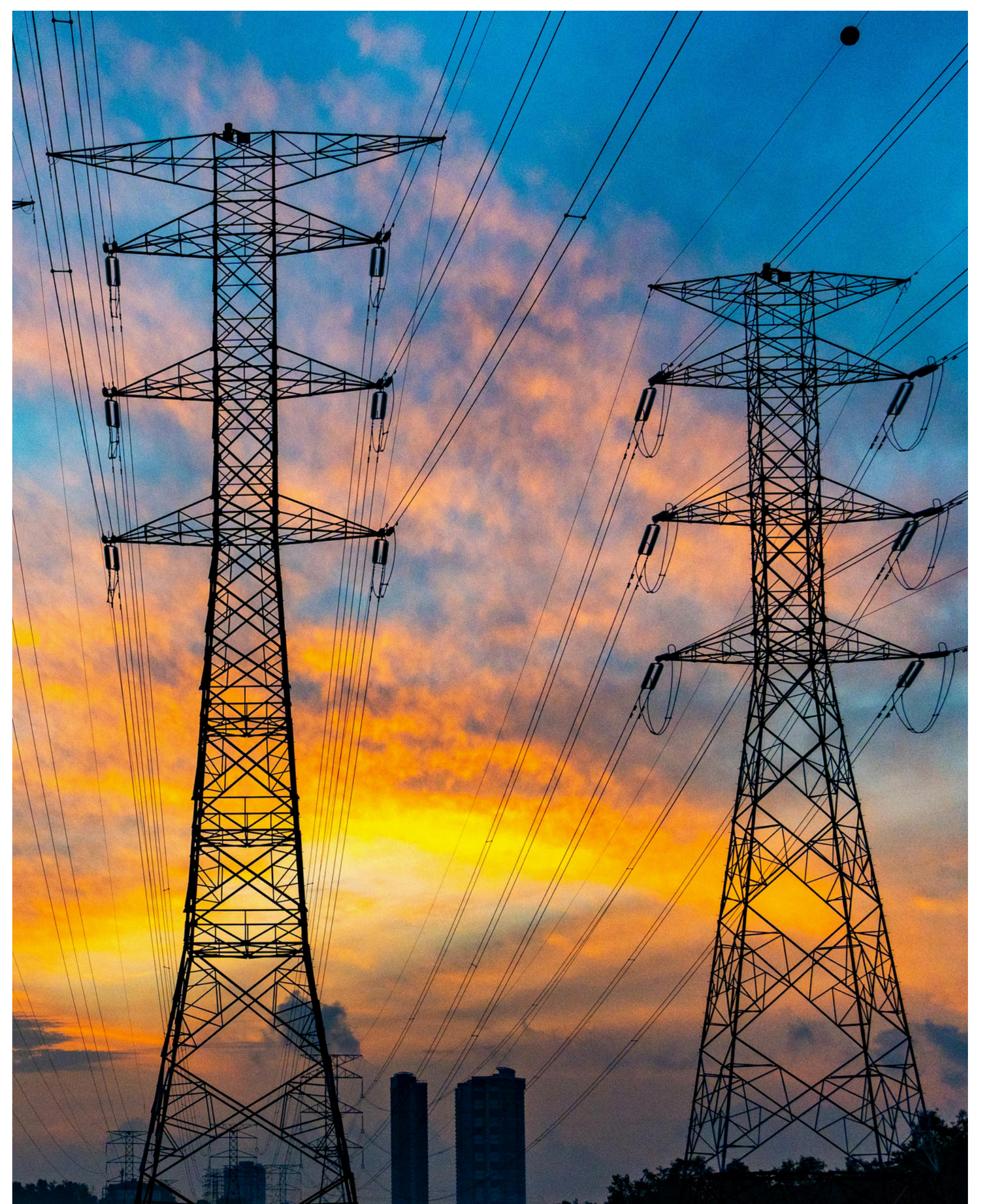
Topics Covered

- Chloroplast structure
- Light-dependent reactions
- Calvin cycle
- Limiting factors
- Photosynthetic pigments

Learning Outcomes

Students should be able to:

- Explain photosynthesis processes
- Describe chloroplast adaptations
- Investigate limiting factors
- Analyse photosynthesis experiments



Modules 14–16: Homeostasis, Control & Inheritance

Module 14: Homeostasis

Topics Covered

- Homeostasis in mammals
- Kidney function
- Osmoregulation
- Blood glucose regulation
- Homeostasis in plants

Learning Outcomes

Students should be able to:

- Explain homeostatic mechanisms
- Describe kidney function
- Explain hormonal regulation
- Analyse plant responses to environmental changes

Module 15: Control and Coordination

Topics Covered

- Nervous system
- Endocrine system
- Neurones and synapses
- Muscle contraction
- Plant responses and hormones

Learning Outcomes

Students should be able to:

- Explain nervous coordination
- Describe hormone action
- Explain impulse transmission
- Analyse plant growth responses

Module 16: Inheritance

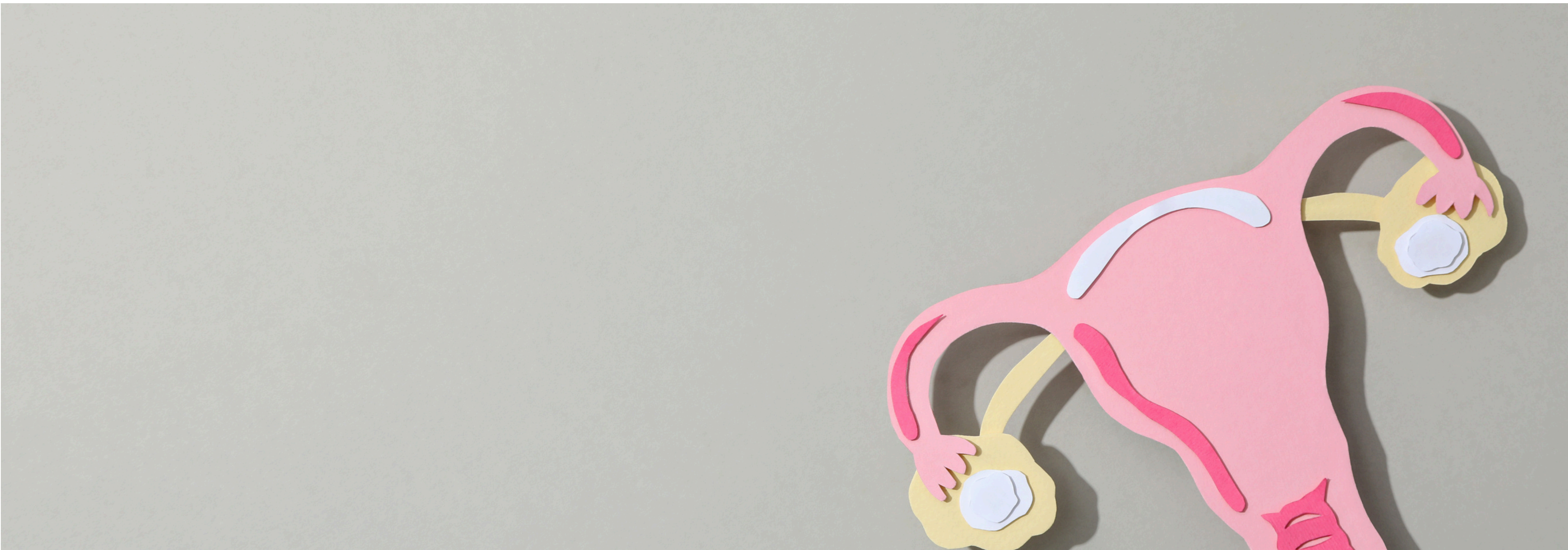
Topics Covered

- Meiosis
- Genetic variation
- Genetic inheritance
- Genetic crosses
- Genes and phenotype
- Evolution and selection

Learning Outcomes

Students should be able to:

- Explain inheritance patterns
- Construct genetic diagrams
- Analyse genetic variation
- Explain the role of genes in determining characteristics



Assessment Framework & Programme Outcome

Continuous Assessment

Students will be assessed through:

- Weekly Assignments
- Topic-Based Tests
- Laboratory Reports
- Practical Investigations
- Class Activities

Module Assessments

At the end of each module, students will complete:

- Written Assessments
- Practical Exercises
- Structured Examination Questions

Mock Examinations

Students will participate in:

- Mid-Programme Mock Examinations
- Final Mock Examinations
- Practical Skills Assessments

Programme Outcome

Upon successful completion of the programme, students will possess a strong understanding of biological principles, practical laboratory skills, scientific reasoning abilities, and problemsolving competencies. They will be equipped for higher education and careers in medicine, pharmacy, nursing, biotechnology, environmental science, agriculture, research, and other life science disciplines.

Final Examination Preparation

Preparation activities include:

- Past Question Practice
- Revision Classes
- Tutor Feedback Sessions
- Performance Reviews
- Examination Readiness Assessments