# Biology

## Macromolecules and Key Biological Principles

10197 (Examination)  
10198 (Alternative assessment)

**GRADED**  
**ACADEMIC SUBJECT CONTENT**

<table>
<thead>
<tr>
<th>Credit Value of Unit 6</th>
<th>GLH of Unit 60</th>
<th>Level of Unit 3</th>
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### Learning Outcomes

<table>
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<tr>
<th>The student should be able to</th>
<th>Assessment Criteria</th>
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<tbody>
<tr>
<td>1 Demonstrate an understanding of the structure and function of major macromolecules</td>
<td>1.1 Describe, using examples, the role of major macromolecules and their importance in functioning of the cell.</td>
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<tr>
<td>2 Demonstrate an understanding of simple Mendelian inheritance mechanisms</td>
<td>2.1 Describe the key aspects of inheritance determined by chromosomal genes</td>
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<tr>
<td>3 Demonstrate an understanding of the process of cellular respiration</td>
<td>3.1 Describe key aspects of the biochemistry of cellular respiration</td>
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### Assessment Methodology

A formal unseen two-hour written examination.

### Grading of this unit

The following grade descriptors will be applied to the assessment of this unit:

1. Understanding of the subject  
2. Application of Knowledge  
3. Use of Information  
4. Communication and Presentation  
5. Autonomy and/or Independence  
6. Quality

Please refer to the QAA Grade Descriptors for detail of the components of each descriptor.
Indicative Content

**Nucleic Acids**

Structure of DNA, mRNA and tRNA; semi conservative replication of DNA; importance of base sequence as genetic code; organisation of DNA into chromosomes through super coiling and association of histone proteins and the importance of this level of organisation in mitosis and meiosis.

**Protein Synthesis**

Importance of DNA, mRNA, tRNA and ribosomes in transcription and translation; example of errors in the genetic code and resulting protein structure e.g. sickle cell anaemia.

**Mendelian Inheritance**

The importance of meiosis in determining inheritance ratios - haploid gametes, independent assortment and crossing over; the importance of genetic variation in evolution; monohybrid inheritance ratios as found in autosomal and sex linked inheritance patterns.

**Carbohydrates, Lipids and Proteins.**

Carbohydrates: chemical composition; structure- monosaccharides (glucose), disaccharides (sucrose) and polysaccharides (starch and glycogen); role in metabolism - energy production, storage, structure and cell recognition and signalling.

Lipids:
- Fats- chemical composition; glycerol and fatty acid components; triglycerides; role in metabolism- energy storage, insulation and cushioning of vital organs.
- Phospholipids- glycerol, fatty acid and phosphate group components; hydrophobic and hydrophilic components; role in cells- major constituents of cell membranes.
- Steroids- four fused carbon rings; role in metabolism- e.g. cholesterol as precursor of sex hormones and component of cell membrane.

Proteins: chemical composition; primary, secondary, tertiary and quaternary structure; peptide bonds; role in metabolism- storage, membrane transport, signalling (chemical messengers), chemical signalling (receptor proteins); movement (contractile proteins), defence (antibodies), catalysis (enzymes).

**Enzymes**

Importance of tertiary structure of protein; biological catalysts lowering activation energy of a reaction; work in sequence to enable both catabolic and anabolic reactions to occur; theories of action (lock & key and induced fit); influence of temperature, pH and inhibitors on action.

**Cellular Respiration**

Anaerobic and aerobic respiration in production of ATP as universal energy source in cells; outline of glycolysis, Krebs Cycle and oxidation phosphorylation without detailed knowledge of enzymes involved.

**Validation end date: 31 August 2019**