



Higher National Unit specification

General information

Unit title: Biology: An Introduction (SCQF level 6)

Unit code: H923 33

Superclass: RH

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Unit purpose

This Unit is designed to introduce learners to key aspects of biology. Learners will also develop practical skills in techniques relevant to microscopy. The Unit is suitable for learners studying at HNC level, and will provide the necessary underpinning knowledge and skills to enable progression to further study of biology at HND level or to seek employment in science based industries.

Outcomes

On successful completion of the Unit the learner will be able to:

- 1 Describe the characteristics of life and categories of living organisms.
- 2 Describe the structure and organisation of different cell types.
- 3 Describe and explain the basic structure and function of biological molecules.
- 4 Perform basic practical experiments related to microscopy.

Credit points and level

1 Higher National Unit credit at SCQF level 6: (8 SCQF credit points at SCQF level 6)

Recommended entry to the Unit

Entry is at the discretion of the centre. No prior biology knowledge is required.

Higher National Unit specification: General information (cont)

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Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the Support Notes for this Unit specification.

There is no automatic certification of Core Skills or Core Skill components in this Unit.

Context for delivery

If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

Equality and inclusion

This Unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.

Higher National Unit specification: Statement of standards

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Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the Knowledge and/or Skills section must be taught and available for assessment. Learners should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Describe the characteristics of life and categories of living organisms.

Knowledge and/or Skills

- ◆ Defined characteristics of life
- ◆ Five Kingdom classification of living organisms
- ◆ Prokaryote and eukaryote cells
- ◆ Viruses

Outcome 2

Describe the structure and organisation of different cell types.

Knowledge and/or Skills

- ◆ Ultrastructure of prokaryote cells and eukaryotic animal and plant cells
- ◆ Function of cell organelles
- ◆ Binary fission
- ◆ Mitosis and meiosis
- ◆ Main tissue types in animals and plants

Outcome 3

Describe and explain the basic structure and function of biological molecules.

Knowledge and/or skills

- ◆ Structure and function of carbohydrates, lipids, proteins and nucleic acids
- ◆ ATP as an energy currency of the cell
- ◆ Cellular respiration
- ◆ Photosynthesis

Higher National Unit specification: Statement of standards (cont)

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Outcome 4

Perform basic practical experiments related to microscopy.

Knowledge and/or skills

- ◆ Binocular microscope experiments
- ◆ Calibration of the microscope
- ◆ Consistent and accurate results
- ◆ Recording observations

Evidence Requirements for this Unit

Written and/or oral recorded evidence for Outcomes 1–3 should be assessed using a holistic closed-book assessment under supervised conditions. The assessment will use a sampling approach to the Knowledge and/or Skills as detailed below. It is recommended that the assessment be completed within one hour.

Performance evidence for Outcome 4 should be assessed by production of an assessor's observation checklist.

Outcome 1

The assessment will sample 3 of the 4 Knowledge and/or Skills items. Learners will not have prior knowledge of which items are being assessed. Those items which are not sampled must be covered in the alternative (re-sit) assessment.

Where an item is sampled, a learner's response will be judged satisfactory where the evidence shows that the learner can:

- ◆ Describe the seven characteristics of living organisms.
- ◆ Classify living organisms according to the Five Kingdom system.
- ◆ Identify features which distinguish prokaryote and eukaryote cells.
- ◆ Describe how viruses can be classified.

Outcome 2

The assessment will sample 4 of the 5 Knowledge and/or Skills items. Learners will not have prior knowledge of which items are being assessed. Those items which are not sampled must be covered in the alternative (re-sit) assessment.

Where an item is sampled, a learner's response will be judged satisfactory where the evidence shows that the learner can:

- ◆ Describe the ultrastructure of prokaryote cells and eukaryote animal and plant cells.
- ◆ Describe the function of cell organelles.
- ◆ Explain the process of binary fission in prokaryotes.
- ◆ Describe the similarities and differences between mitosis and meiosis.
- ◆ Describe the main tissue types seen in animals and plants.

Higher National Unit specification: Statement of standards (cont)

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Outcome 3

The assessment will sample 3 of the 4 Knowledge and/or Skills items. Learners will not have prior knowledge of which items are being assessed. Those items which are not sampled must be covered in the alternative (re-sit) assessment.

Where an item is sampled, a learner's response will be judged satisfactory where the evidence shows that the learner can:

- ◆ Describe the basic structure and function of carbohydrates, lipids, proteins and nucleic acids.
- ◆ Explain why ATP is used as energy currency of the cell.
- ◆ Describe how the process of cellular respiration is used to make ATP.
- ◆ Explain the role that ATP plays in the process of photosynthesis.

Outcome 4

Learners will perform a minimum of three practical experiments: record observations of a typical animal cell; record observations of a typical plant cell; prepare and use a simple stain to determine cell size. A learner's response will be judged satisfactory where the evidence shows that the learner can achieve all of the following:

- ◆ Perform experiments using a binocular microscope.
- ◆ Calibrate the microscope correctly.
- ◆ Achieve consistent and accurate results.
- ◆ Record experimental observations clearly and accurately.

An assessor observation checklist will be used to record the learner's performance of the practical work in line with given instructions and health and safety requirements.

Where a learner does not perform an assessed practical experiment to the required standard, they will be given the chance to either reattempt the same practical experiment, or to undertake a different practical experiment of similar complexity.



Higher National Unit Support Notes

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Unit Support Notes are offered as guidance and are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

This Unit is intended as part of the framework for HNC Applied Sciences, HND Applied Biological Sciences and HND Applied Chemical Sciences but may be suitable for inclusion in other HN Science awards. It is designed to provide an introduction to biology for learners who require biology knowledge and skills to underpin further studies.

Outcome 1 — Describe the characteristics of life and categories of living organisms

This Outcome introduces learners to the seven defined characteristics of life: Nutrition, Excretion, Respiration, Sensitivity, Reproduction, Growth and Movement.

Learners will understand how to classify living organisms according to the Five Kingdom system: Monera, Protista, Fungi, Plantae and Animalia.

Learners will also identify features which distinguish a prokaryotic cell from a eukaryotic cell, and should be able to determine the classification of viruses.

Outcome 2 — Describe the structure and organisation of different cell types

This Outcome looks at the structure and function of cell organelles typically found within the ultrastructure of prokaryotes and both eukaryotic animal and plant cells: cell wall, cell membrane, nucleus, ribosomes, rough endoplasmic reticulum, Golgi apparatus, smooth endoplasmic reticulum, lysosomes, mitochondria, chloroplasts and vacuoles.

Learners should become familiar with methods of cell reproduction and division — binary fission, mitosis and meiosis.

Cell differentiation into tissues and organs should also be covered along with the main tissue types found in animals and plants.

Outcome 3 — Describe and explain the basic structure and function of biological molecules

This Outcome introduces the learners to the basic structure of carbohydrates, lipids, proteins and nucleic acids, and how the structure relates to the important function of these molecules.

Higher National Unit Support Notes (cont)

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The importance of ATP as an energy currency will be covered highlighting how the structure of the molecule relates to its function: release of energy from phosphoanhydride bonds on breakdown of ATP into ADP plus Pi.

Aerobic respiration and its role in the production of ATP: Glycolysis, Krebs Cycle and the Cytochrome System. The process of anaerobic respiration in animals and plants.

The production of ATP in the light dependent stage of photosynthesis and its consequent role in the carbon fixation stage will also be covered.

Outcome 4 — Perform basic practical experiments related to microscopy

Guidance on suitable practical experiments for assessment purposes is given elsewhere in this document. However, it is envisaged that learners will also participate in a range of other practical experiments which will both develop their laboratory skills and support the theory covered in Outcomes 1–3.

Guidance on approaches to delivery of this Unit

Outcomes 1–3 would best be delivered in order, and can be delivered through a wide range of learning and teaching activities including standard presentations, directed and written question and answers, online tutorials, learner oral presentations and computer based poster presentations. However, Outcome 4 lends itself to being delivered in a similar timeframe to the theory covered within Outcome 2.

It is envisaged that delivery of Outcome 1 could commence with coverage of the seven defined characteristics of life. Learners will then be introduced to the Five Kingdom classification system and its use in classifying living organisms. The features which distinguish between prokaryote, eukaryote plant and animal cells could then be discussed along with the classification of viruses.

Outcome 2 is intended to provide a greater understanding of the role of cell organelles typically found within the ultrastructure of prokaryote and eukaryote plant and animal cells. It is possible to integrate delivery of Outcomes 2 and 4 as this would allow the learner to develop a deeper understanding of the structure and role of cell organelles as seen in different cell types.

Outcome 3 is intended to introduce the learner to the basic structure and function of carbohydrates, lipids, proteins and nucleic acids. It is envisaged that the use of ATP as an energy currency could then be covered as well as its production and use in both respiration and photosynthesis.

It is envisaged that Outcome 4 could be delivered alongside Outcome 2. However, it is also possible for Outcome 4 to be delivered at the end of the theoretical based Outcomes 1 and 3. A range of practical experiments could be utilised to both support understanding of the underlying theory and to prepare learners for undertaking the assessed practical experiments. Aspects suitable for experimental investigation might include examining typical plant and animal cells and preparing simple smears.

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Guidance on approaches to assessment of this Unit

Evidence can be generated using different types of assessment. The following are suggestions only. There may be other methods that would be more suitable to learners.

Outcomes 1-3 could be assessed by a single holistic closed-book assessment with an appropriate cut-off score that covers the sampling requirements as detailed in the Evidence Requirements. Assessment should be carried out in supervised conditions, and it is recommended that the assessment be completed within 60 minutes.

Where evidence of Outcomes 1-3 is assessed by sampling, the whole of the content listed in the Knowledge and/or Skills must be taught and available for assessment. Learners should not know in advance the items on which they will be assessed, and different items should be sampled on each assessment occasion. Any items not sampled in the first assessment, must be included in the alternative (re-sit) assessment.

In Outcome 4 learners are required to undertake three assessed practical experiments: record observations of a typical animal cell; record observations of a typical plant cell; prepare and use a simple stain to determine cell size. Examples of suitable experiments are given below. However, this list is not prescriptive, and other practical experiments of similar complexity may be used by the centre.

Suitable practical experiments are:

Examine and represent a typical animal cell:

- ◆ Prepared slide of columnar epithelium
- ◆ Prepared slide of adipose tissue
- ◆ Prepared slide of cardiac muscle

Examine and represent a typical plant cell:

- ◆ Prepared slide of plant lower epidermis and guard cells
- ◆ Prepared slide of onion root tip cells
- ◆ Prepared slide of palisade mesophyll cells

Prepare a simple stain:

- ◆ Preparation of a temporary mount of onion epidermis
- ◆ Preparation of a cheek epithelial cell smear

Assessed practical experiments will usually be performed individually. However, there may be some experiments that are suitable to be undertaken in pairs or small groups. If this is the case then the assessor should ensure that all participants are actively involved and are able to adequately demonstrate the required skills.

An exemplar instrument of assessment with marking guidelines has been produced to indicate the national standard of achievement at SCQF level 6.

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Centres are reminded that prior verification of centre-devised assessments would help to ensure that the national standard is being met. Where learners experience a range of assessment methods, this helps them to develop different skills that should be transferable to work or further and higher education.

Opportunities for e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. Centres which wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA's qualifications is available at www.sqa.org.uk/e-assessment.

Opportunities for developing Core and other essential skills

The delivery and assessment of this Unit will provide learners with the opportunity to develop the Core Skills of *Numeracy* at SCQF level 5, and *Information and Communication Technology (ICT)* at SCQF level 4.

Numeracy — Using Number at SCQF level 5

Learners will be required to decide on the steps and operations required to calibrate microscopes.

Information and Communication Technology (ICT) — Providing/Creating Information at SCQF level 4

Learners will make effective use of ICT packages to produce reports. Packages used will likely include word processing.

Sustainability

Sustainability can be embedded in delivery of the Unit in a variety of ways. For example, by encouraging minimum usage, correct disposal procedures and possible recycling (eg of microscope slides) during practical experiments.

History of changes to Unit

Version	Description of change	Date

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General information for learners

Unit title: Biology: An Introduction (SCQF level 6)

This section will help you decide whether this is the Unit for you by explaining what the Unit is about, what you should know or be able to do before you start, what you will need to do during the Unit and opportunities for further learning and employment.

This is a 1 credit Unit at SCQF level 6, which you are likely to be studying as part of the first year of an HNC/HND science programme. The Unit will provide you with an introduction to biology, and it does not require any previous biology knowledge.

On completion of this Unit you should be able to:

- 1 Describe the characteristics of life and categories of living organisms.
- 2 Describe the structure and organisation of different cell types.
- 3 Describe and explain the basic structure and function of biological molecules.
- 4 Perform basic practical experiments related to microscopy.

Outcome 1

In this Outcome you will be introduced to the main characteristics which define a living organism. You will discuss how living organisms can be classified according to the Five Kingdom classification system and you will identify features which will enable you to distinguish between a prokaryotic and eukaryotic cell. In addition, you will learn how viruses can be classified.

Outcome 2

In this Outcome you will investigate the structure and function of cell organelles typically found within the ultrastructure of prokaryote cells and eukaryote animal and plant cells. You will become familiar with the process and importance of cellular reproduction and division. In addition, you will cover differentiation of cells into tissues and organs along with an investigation into the main tissue types found in animals and plants.

Outcome 3

In this Outcome you will be introduced to the basic structure of biological molecules, namely carbohydrates, lipids, proteins and nucleic acids. The importance of their structure and how it relates to its biological function will also be covered.

You will gain an understanding of why Adenosine tri-phosphate (ATP) is used as a cellular energy source and you will discover how the molecule is produced and used during the process of cellular respiration and photosynthesis.

Outcome 4

In this Outcome you will undertake three assessed practical experiments, based on the content of Outcomes 1–3.

General information for learners (cont)

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During this work you will develop practical skills in microscopy. You will learn how to use a binocular microscope safely and correctly, how to calibrate a binocular microscope and how to record what you see under the binocular microscope. You will be examining prepared slides of typical animal and plant cells, preparing a simple stain and determining cell size.

Assessment

For Outcomes 1 to 3 you could take a closed-book, end of Unit assessment.

Outcome 4 will be assessed after you have learned the necessary practical skills, and will take the form of three practical experiments.

Core Skills

Although there is no automatic certification of Core Skills in the Unit, you will have opportunities to develop the Core Skills of *Numeracy* at SCQF level 5, and *Information and Communication Technology (ICT)* at SCQF level 4.