Rewarding Learning

CCEA GCSE Specification in Biology

For first teaching from September 2011

For first assessment from Summer 2012
For first award in Summer 2013

Subject Code: 1010

Version 2 31 August 2011

Foreword

This booklet contains CCEA's General Certificate of Secondary Education (GCSE) Biology for first teaching from September 2011. We have designed this specification to meet the requirements of the following:

- GCSE Subject Criteria for Biology;
- GCSE Qualifications Criteria;
- Common Criteria for all Qualifications;
- GCSE Controlled Assessment Biology Regulations; and
- GCSE Controlled Assessment Generic Regulations.

We will make the first full award based on this specification in summer 2013.

We are now offering this specification as a unitised course. This development increases flexibility and choice for teachers and learners.

The first assessment for the following unit will be available in summer 2012:

- Unit 1 (Foundation/Higher): Cells, Living Processes and Biodiversity.

We will notify centres in writing of any major changes to this specification. We will also publish changes on our website at www.ccea.org.uk

The version on our website is the most up-to-date version. Please note that the web version may be different from printed versions.

Subject Code	1010
QAN	600/1164/6

You may download further copies of this publication from www.ccea.org.uk

Contents

1 Introduction

This specification sets out the content and assessment details for our GCSE Biology course. First teaching begins from September 2011, and we will make the first awards for this specification in 2013. You can view and download the latest version of this specification on our website at www.ccea.org.uk

The specification builds on the broad objectives of the Northern Ireland Curriculum. It is also relevant to key curriculum concerns in England and Wales.

A course based on this specification should help facilitate the study of biology and related subjects at a more advanced level, for example Advanced Subsidiary Biology and Advanced Biology. For those progressing directly into employment, a GCSE in biology is relevant not only to the fields of science and medicine, but also to areas of commerce and public service that value problem-solving and practical skills.

1.1 Aims and learning outcomes

This specification encourages students to be inspired, motivated and challenged by following a broad, coherent, practical, satisfying and worthwhile course of study. It encourages them to develop their curiosity about the living world and provides insight into and experience of how science works. It enables students to engage with biology in their everyday lives and to make informed choices both about further study in biology-related disciplines and about their careers.

This specification aims to enable students to:

- develop their knowledge and understanding of biology;
- develop their understanding of the effects of biology on society;
- develop an understanding of the importance of scale in biology;
- develop and apply their knowledge and understanding of the nature of science and of the scientific process;
- develop their understanding of the relationships between hypotheses, evidence, theories and explanations;
- develop their awareness of risk and the ability to assess potential risk in the context of potential benefits;
- develop and apply their observational, practical, modelling, enquiry and problem-solving skills and understanding in laboratory, field and other learning environments;
- develop their ability to evaluate claims based on science through critical analysis of the methodology, evidence and conclusions both qualitatively and quantitatively; and
- develop their skills in communication, mathematics and the use of technology in scientific contexts.

1.2 Key features

The key features of the specification appear below:

- The specification involves a new approach to biology at GCSE by incorporating the skills, knowledge and understanding of how science works.
- The specification is divided into three units.
- Units 1 and 2 are each assessed by a written examination either at Foundation Tier (grades C–G) or Higher Tier (grades A*–D/E).
- From summer 2013, students may take Unit 1 or Unit 2 at the end of their first year of study. (Please note that in summer 2012, only Unit 1 will be available.)
- We set the controlled assessment tasks for Unit 3: Practical Skills. Students must complete one task. Teachers supervise it and mark students according to our mark scheme, and we moderate the results.
- Students can resit each unit once.
- The specification provides a thorough preparation for the study of biology and related courses at GCE Advanced Level and Advanced Subsidiary Level. It also allows students to develop transferable skills that will benefit them in vocational training and employment.
- There is a range of support available for both teachers and students, including specimen papers, mark schemes and schemes of work. You can download these from our website at www.ccea.org.uk

1.3 Prior attainment

The specification builds on the knowledge, skills and understanding developed through the Northern Ireland curriculum for science at Key Stage 3. There is no particular level of attainment required; however, before studying this specification, we expect students to have a level of skills in science, numeracy, literacy and communication that is commensurate with having studied science to Key Stage 3.

1.4 Classification codes and subject combinations

Every specification is assigned a national classification code that indicates the subject area to which it belongs. The classification code for this qualification is 1010.

Progression to another school/college

Should a student take two qualifications with the same classification code, schools and colleges that they apply to may take the view that they have achieved only one of the two GCSEs. The same view may be taken if students take two GCSE qualifications that have different classification codes but have content that overlaps significantly. Students who have any doubts about their subject combinations should check with the schools and colleges that they wish to attend before embarking on their planned study.

Centres in England

Centres in England should also be aware that, for the purpose of the School and College Achievement and Attainment Tables, if a student enters for more than one GCSE qualification with the same classification code, only one grade (the highest) will count.

1.5 How science works

Section 3 of our specification includes learning outcomes that allow students to develop the specific skills, knowledge and understanding of how science works. To identify these clearly, the learning outcome is followed by the letter *w* and is cross referenced to the specific skills, knowledge and understanding that appear below (for example (*w – (ii)b*)).

The skills, knowledge and understanding of how science works are:

(i) data evidence, theories and explanations:

(a) the collection and analysis of scientific data;
(b) the interpretation of data, using creative thought, to provide evidence for testing ideas and developing theories;
(c) many phenomena can be explained by developing and using scientific theories, models and ideas; and
(d) there are some questions that science cannot currently answer and some that science cannot address;

(ii) practical and enquiry skills:

(a) planning to test a scientific idea, answer a scientific question or solve a scientific problem;
(b) collecting data from primary or secondary sources, including the use of ICT sources and tools;
(c) working accurately and safely, individually and with others, when collecting first-hand data; and
(d) evaluating methods of data collection and considering their validity and reliability as evidence;

(iii) communication skills:

(a) recalling, analysing, interpreting, applying and questioning scientific information or ideas;
(b) using both qualitative and quantitative approaches; and
(c) presenting information, developing an argument and drawing a conclusion, using scientific, technical and mathematical language, conventions and symbols, and using ICT tools;

(iv) applications and implications of science:

(a) the use of contemporary scientific and technological developments, and their benefits, drawbacks and risks;
(b) how and why decisions about science and technology are made, including those that raise ethical issues, and about the social, economic and environmental effects of such decisions; and
(c) how uncertainties in scientific knowledge and scientific ideas change over time and the role of the scientific community in validating these changes.

2 Specification at a Glance

The table below summarises the structure of this GCSE course:

Content	Assessment	Weighting	Availability
Unit 1: Cells, Living Processes and Biodiversity	An externally assessed written examination consisting of a number of compulsory structured questions that provide opportunities for short answers, extended writing and calculations Foundation Tier: 1 hour 15 mins Higher Tier: 1 hour 30 mins	35%	Every Summer (beginning in 2012)
Unit 2: Body Systems, Genetics, Microorganisms and Health	An externally assessed written examination consisting of a number of compulsory structured questions that provide opportunities for short answers, extended writing and calculations Foundation Tier: 1 hour 30 mins Higher Tier: 1 hour 45 mins	40%	Every Summer (beginning in 2013)
Unit 3: Practical Skills	Controlled assessment Students complete one controlled assessment task from a choice of two. Teachers mark the task and we moderate the results.	25%	From September (beginning in 2011) (submitted every May beginning 2013)

At least 40 percent of the assessment (based on unit weightings) must be taken at the end of the course as terminal assessment.

3 Subject Content

We have divided the course into three units. The content of each unit, as well as the respective learning outcomes, appears below.

Content for the **Higher Tier only** is in ***bold italics***.
Questions in Higher Tier papers may be set on **any** content in the specification.

Content for the Foundation Tier is in normal type.
Questions in Foundation Tier papers will be set **only** on this content.

Students should have opportunities to experiment and carry out their own investigations throughout their course of study.

3.1 Unit 1: Cells, Living Processes and Biodiversity

This unit deals with cells, photosynthesis and plants, nutrition and health, enzymes and digestion, breathing and the respiratory system, nervous system and hormones, and ecological relationships and energy flow.

Cells

In this section, students investigate the cell and its importance as the fundamental building block of life.

Content	Learning Outcomes
1.1 Cells **Magnification** **Animal Cells** **Plant Cells** **Bacterial Cells** **Specialisation**	In the context of how science works, students should be able to: 1.1.1 use a light microscope to examine and identify the structures of a typical plant and animal cell (*w – (ii)b, (ii)c*); 1.1.2 calculate the actual size of a specimen ***and calculate magnification using a scale bar*** (*w – (iii)b, (iii)c*); 1.1.3 know the structure and function of animal cells, to include nucleus and chromosomes, cytoplasm, and cell and nuclear membranes (*w – (iii)a*); 1.1.4 know that plant cells have additional structures not found in animal cells: cellulose cell wall, large permanent vacuole and chloroplasts; 1.1.5 compare and contrast the structure of bacterial cells with plant and animal cells: non-cellulose cell wall, absence of nucleus and presence of plasmids (*w – (i)a*); and 1.1.6 understand that multi-celled organisms' cells are organised to form specialised tissues, organs and organ systems ***to improve exchange with the environment, to transport substances and to communicate between cells*** (*w – (iii)a*).

Content	Learning Outcomes
Growth	In the context of how science works, students should be able to: 1.1.7 compare and contrast the patterns of growth and development in plant and animal cells: animals grow all over and plants grow at apices to produce a branching pattern (*w – (i)a*);
Stem Cells	1.1.8 understand that animal cells originate from stem cells which later become specialised and that animal cells lose the ability to differentiate at an early stage of development (*w – (iv)a*); 1.1.9 understand: – the ethical implications of the applications of stem cell research; – the need for government control of this research to protect the public (*w – (iv)c*); and – the need for validation of this research (for example by peer review); and
Diffusion	1.1.10 investigate the process of diffusion as the movement of molecules from a region of high concentration to a region of low concentration (*w – (i)a, (i)b, (i)c, all of (ii)*).

Photosynthesis and Plants

In this section, students investigate and explain photosynthesis as the key process that enables plants to make food, as well as the role of plants in supporting life.

Content	Learning Outcomes
1.2 Photosynthesis and Plants **Investigating Photosynthesis**	In the context of how science works, students should be able to: 1.2.1 investigate how light, carbon dioxide and chlorophyll are needed for photosynthesis (*w – all of (ii)*): – how and why a plant is destarched; – the steps involved in testing a leaf for starch (*w – (iii)b*); – the production of oxygen (*w – (iii)b*); – the use of sodium hydroxide to absorb carbon dioxide; and – using a variegated leaf to illustrate the role of chlorophyll in the chloroplast in trapping light; and
Equation for Photosynthesis	1.2.2 derive the word equation for photosynthesis ***and recall the balanced chemical equation*** to illustrate biology as an evidence-based discipline (*w – (i)b*).

Content	Learning Outcomes
Leaf Structure	In the context of how science works, students should be able to: 1.2.3 use a microscope to examine the structure and shape of the mesophytic leaf and identify its adaptations for gas exchange and light absorption, to include epidermis, cuticle, palisade mesophyll with chloroplasts, spongy mesophyll, intercellular spaces, guard cells and stomata (*w – (ii)b, (ii)c*);
Uses of Products of Photosynthesis	1.2.4 explain how a plant uses the products of photosynthesis;
Limiting Factors	1.2.5 investigate the factors affecting the rate of photosynthesis (light intensity, temperature and concentration of carbon dioxide) and interpret data on the rate of photosynthesis in terms of limiting factors (*w – all of (ii)*);
Economic Implications	1.2.6 using secondary sources of data, investigate the economic implications in commercial crop production of enhancing environmental factors (artificial lighting, carbon dioxide enrichment and fertilisers) (*w – (ii)b, (ii)d*); and
Compensation Point	1.2.7 ***investigate (using hydrogencarbonate indicator) the relationship between photosynthesis and respiration in plants*** (*w – all of (ii)*), ***to include:*** – ***knowledge of the colour changes of hydrogencarbonate indicator (high CO_2 – yellow, normal CO_2 – red, low CO_2 – purple)*** (*w – (iii)a*); ***and*** – ***demonstrating compensation point.***

Nutrition and Health

In this section, students investigate food composition and explore health issues associated with our approach to food and exercise.

Content	Learning Outcomes
1.3 Nutrition and Health **Food Tests**	In the context of how science works, students should be able to: 1.3.1 by carrying out food tests, investigate the idea of a balanced diet by using food samples and food test reagents, including: – reducing sugar (Benedict's); – starch (iodine solution); – amino acid/protein (Biuret); – fats (ethanol); and

<table>
<tr><th>Content</th><th>Learning Outcomes</th></tr>
<tr><td></td><td>– Vitamin C (DCPIP) (w – (ii)a, (ii)b, (ii)c, (iii)b).</td></tr>
<tr><td>Food Tests (cont.)</td><td>In the context of how science works, students should be able to:
1.3.2 recall the following reagents and their colour changes:
<table>
<tr><th>Reagent</th><th>Initial colour</th><th>End colour for positive result</th></tr>
<tr><td>Benedict's</td><td>Blue</td><td>Brick red precipitate</td></tr>
<tr><td>Iodine</td><td>Yellow/Brown</td><td>Blue/Black</td></tr>
<tr><td>Biuret</td><td>Blue</td><td>Purple</td></tr>
<tr><td>Ethanol</td><td>Clear</td><td>White emulsion</td></tr>
<tr><td>DCPIP</td><td>Blue</td><td>Pink and then colourless</td></tr>
</table>
1.3.3 use DCPIP to compare quantitatively (volume × concentration) the vitamin C content of vegetable and fruit juices to a standard solution of ascorbic acid – juices for comparison can be natural, processed or boiled (w – all of (ii), (iii)b, (iii)c);</td></tr>
<tr><td>Sources and Functions of the Components of a Balanced Diet</td><td>1.3.4 know the principal elements present in carbohydrates, fats and proteins, and the sources and functions of:
– simple carbohydrates (sugars, glucose and lactose);
– complex carbohydrates (cellulose, glycogen and starch);
– fats (fatty acids and glycerol);
– proteins (amino acids);
– vitamins C and D (deficiency symptoms);
– minerals (iron and calcium and their deficiency symptoms);
– fibre; and
– water;</td></tr>
<tr><td>Food and Energy</td><td>1.3.5 investigate the energy content of food by burning food samples, calculate the results and compare their data with data from food labels, evaluating the methods of data collection and their reliability and validity (w – all of (ii)); and

1.3.6 use secondary data to calculate BMI and BMR rates, and work out recommended daily energy intake using the Harris–Benedict mathematical model (w – (iii)b, (iii)c).</td></tr>
</table>

Content	Learning Outcomes
Food and Energy (cont.) **Food and Health**	In the context of how science works, students should be able to: 1.3.7 understand that energy requirements vary with age, gender, activity levels and pregnancy; 1.3.8 understand how human health is affected by: – inherited factors; – environmental factors – obesity can be caused by energy intake being higher than energy used in exercise; and – healthy food choices – limited intake of sugar, salt and fat and the benefit of fruit and vegetables; 1.3.9 understand the contribution of an unhealthy diet to obesity, heart disease, strokes, high blood pressure, diabetes and arthritis; and 1.3.10 understand the costs to society of the current trend in obesity levels, to include the economic cost of treatment for the NHS (*w – (iv)b*).

Enzymes and Digestion

In this section, students investigate enzymes and learn about the digestive system and how food enters the bloodstream.

Content	Learning Outcomes
1.4 Enzymes and Digestion **Enzymes**	In the context of how science works, students should be able to: 1.4.1 investigate the actions of enzymes as proteins that are biological catalysts which speed up the rate of reactions, to include carbohydrase (amylase), lipase and protease, and interpret the results in terms of the lock and key model illustrating substrate specificity (*w – (i)c, all of (ii)*).

Content	Learning Outcomes
Enzymes (cont.)	In the context of how science works, students should be able to: 1.4.2 investigate and interpret the effects of temperature, pH and enzyme concentration on the action of enzymes (*w – all of (ii)*) ***in terms of:*** – ***low temperature causing reduced rates of collision between substrate and enzyme;*** – ***describing the maximum rate of reaction as the optimum; and*** – ***denaturation occurring increasingly at levels above the optimum, explained as irreversible change to the shape of the active site that inhibits enzyme action;*** 1.4.3 understand that enzymes are needed to break down (digest) large, insoluble molecules into small, soluble ones: – in biological washing powders, as an example of commercial use; and – in the digestion of food, which can then be absorbed into the bloodstream, in the body;
The Digestive System	1.4.4 identify the component parts of the digestive system and relate their position along the alimentary canal to their function (*w – (iii)a*), to include: – buccal cavity – the mechanical digestion by teeth and the chemical digestion of starch by amylase; – stomach – the production of gastric juice containing protease enzyme and acid, and the digestion of proteins; – liver – the production of bile, its storage in the gall bladder and its actions in the duodenum in the neutralisation of acids and emulsification of fats; – duodenum – enzyme production by the pancreas and the duodenal wall, to include carbohydrases, lipases and proteases; – ileum – relate its structure to its function of absorption of digested food molecules and the ways it is adapted – large surface area (length, folds and villi), good blood supply, and thin and permeable membranes; – colon – large surface area for water absorption; and – rectum and anus – storage and removal of faeces; and 1.4.5 ***explain how the structure of a villus (finger-like shape, single layer of surface cells, capillary network and lacteal) is adapted for the efficient absorption of digested food molecules.***

Breathing and the Respiratory System

In this section, students investigate respiration as a cellular process, the structures and functions of the parts of the respiratory system, the mechanism of breathing, and the effect of exercise on the respiratory system. Aerobic and anaerobic respiration are also addressed.

Content	Learning Outcomes
1.5 Breathing and the Respiratory System	In the context of how science works, students should be able to:
Lung Model	1.5.1 investigate the effect of exercise on breathing rate (*w – all of (ii)*);
The Respiratory System	1.5.2 use a lung model to describe and explain breathing as changes in pressure and volume that result from the actions of the diaphragm, ribs and intercostal muscles (*w – (i)c*);
Composition of Inhaled and Exhaled Air	1.5.3 consider the similarities and differences in structure and function between a lung model and the respiratory system in terms of nasal cavity, trachea, bronchus, bronchioles, lungs, alveoli, diaphragm, ribs, intercostal muscles, pleural membranes ***and pleural fluid***;
Respiratory Surfaces	1.5.4 analyse and interpret data on the percentage composition of inhaled and exhaled air in terms of gas exchange, transport and cell respiration (*w – (ii)b, (ii)d, (iii)a*);
Uses of Energy Released	1.5.5 explain the adaptations of respiratory surfaces in plants and animals, to include large surface area, thin, moist, permeable, good blood supply and diffusion gradient (*w – (iii)a*);
Equation for Respiration	1.5.6 understand that respiration releases energy that organisms can use for heat, movement, growth, reproduction ***and active transport***;
Aerobic and Anaerobic Respiration	1.5.7 recall the word equation for aerobic respiration ***and the balanced chemical equation*** (*w – (iii)a*); and 1.5.8 ***compare and contrast aerobic and anaerobic respiration in mammalian muscle and yeast, to include the word equations for mammalian muscles and yeast.***

Nervous System and Hormones

In this section, students understand how the nervous system and hormones are involved in coordination and internal maintenance in the body. The condition of diabetes is addressed. The role of hormones in plants is also explored.

Content	Learning Outcomes
1.6 Nervous System and Hormones	In the context of how science works, students should be able to:
	1.6.1 compare and contrast the two communication systems in the human body (nervous system and hormonal system), to include the speed and nature of the response (*w – (iii)a*);
Central Nervous System	1.6.2 know that the brain and spinal cord form the central nervous system that controls and coordinates the responses between the receptors and effectors (muscles);
The Eye	1.6.3 use models and specimens to identify the component parts of the eye (conjunctiva, cornea, pupil, iris, lens, aqueous and vitreous humours, retina and optic nerve) and understand their functions in producing a focused image on the retina under different light conditions (*w – (i)c, (iii)a*);
	1.6.4 extend their knowledge and understanding of the eye, to include the principal functions of the component parts: – ***how the ciliary muscles and suspensory ligaments change the shape of the lens so that near and distant objects may be focused on the retina (accommodation); and*** – ***how the radial and circular muscles of the iris act to control the amount of light falling on the retina*** (*w – (iii)a*);
Neurones and Synapses	1.6.5 ***understand how neurones are adapted to their function by their branched ends, long length and insulating sheath; and***
	1.6.6 ***understand synapses as gaps between neurones which:*** – ***function as junctions; and*** – ***allow the nerve impulse to pass due to diffusion of a transmitter chemical produced by the end of the neurone leading into the synapse, which in high enough concentration triggers an impulse in the next neurone.***

Content	Learning Outcomes
Voluntary and Reflex Actions **Reflex Arc** **Hormones** **Diabetes**	In the context of how science works, students should be able to: 1.6.7 ***distinguish between voluntary and reflex actions in terms of conscious control and speed of response;*** 1.6.8 ***understand the pathway of the spinal reflex arc in terms of sensory, association and motor neurones linked at synapses*** (*w – (iii)a*); 1.6.9 understand that hormones, to include insulin ***and glucagon***, are chemical messengers that travel in the blood to a target organ, where they act (*w – (iii)a*): – insulin is produced by the pancreas in response to increasing blood glucose levels and acts in the liver; – insulin lowers blood glucose levels by converting glucose to glycogen or respiring more glucose in the liver; and – ***glucagon is also produced by the pancreas in response to reducing blood glucose levels and acts in the liver*** (*w – (iv)a*); 1.6.10 ***explain negative feedback exemplified by the role of insulin in the control of blood sugar;*** and 1.6.11 understand: – that diabetes is a condition in which the blood glucose control mechanism fails; – that the symptoms of diabetes include high blood glucose, the presence of glucose in the urine, lethargy and thirst; – that possible long-term effects of diabetes include eye damage, kidney failure, heart disease and strokes (*w – (i)b, (i)c, (i)d*); – that the number of people with diabetes in the population is rising and evaluate why; and – ***the general principle that many scientific theories are developed in stages using different lines of evidence, having an awareness of the collaborative nature of science and the way new scientific knowledge is validated (for example peer review).***

Content	Learning Outcomes
Plant Hormones	In the context of how science works, students should be able to: 1.6.12 investigate and interpret evidence (secondary data) on how plants respond to external stimuli – phototropism in stems as a differential growth of cells caused by uneven distribution of the hormone auxin (*w – all of (ii)*) ***in terms of:*** – ***auxin produced at tip of shoot;*** – ***auxin moving down the shoot;*** – ***light causing uneven distribution of auxin; and*** – ***auxin causing cell elongation which results in bending of the shoot***; and 1.6.13 understand the commercial uses that have been developed for plant hormones in: – selective weed killers – ***causing death by excessive cell growth in roots and stems;*** – rooting powder – ***increasing the development of roots at the end of cut stems;*** – tissue culture – ***causing a callus of cells to develop into a stem and roots;*** – the stimulation of flowering; and – fruit formation.

Ecological Relationships and Energy Flow

In this section, students are expected to observe living specimens and carry out fieldwork in a natural ecosystem, to help them develop an understanding that life on Earth is ultimately reliant on energy from the Sun and that this energy is transferred through the ecosystem by feeding relationships. Any animals or plants collected should be returned to their habitat as soon as possible.

Content	Learning Outcomes
1.7 Ecological Relationships and Energy Flow **Fieldwork** **Keys**	In the context of how science works, students should be able to: 1.7.1 use appropriate sampling techniques, for example quadrats, pooter, pitfall traps and nets, to investigate changes in the distribution of organisms within a sample area of a habitat (*w – all of (ii)*); and 1.7.2 use and construct keys to identify organisms and classify them into major groups based on observable features (*w – (iii)a, (iii)b*).

Content	Learning Outcomes
Classification	In the context of how science works, students should be able to: 1.7.3 use observations of organisms to help describe the main features of the five kingdoms (protoctista, bacteria, fungi, plants and animals), to include: – mode of nutrition; – cell wall; and – cellular organisation; 1.7.4 understand the difficulties in classifying: – a species as a group of organisms, with shared features, which can breed together to produce fertile offspring; and – viruses, which lack cellular organisation and are therefore considered by many biologists as non-living, and understand that classification systems change over time; 1.7.5 understand why classification is needed for: – identification; – the study of how organisms have changed through time; – the comparison of biodiversity; and – conservation of species;
Ecological Terms	1.7.6 understand the meaning of the terms biodiversity, population, habitat, environment, community and ecosystem;
Ecological Measurements	1.7.7 measure biotic and abiotic factors such as wind speed, water, pH, light, temperature and biodiversity (the number of plant and animal species) (*w – (ii)b, (ii)c, (ii)d*);
Distribution of Organisms	1.7.8 use data collected (primary or secondary) as evidence to account for the distribution of organisms (*w – (i)a, (ii)b, (ii)d, (iii)c*);
Competition	1.7.9 account for this distribution in terms of the adaptations of the organisms found to their environment and competition for resources, which can affect population growth (water, light, space and minerals in plants, and water, food, territory and mates in animals) (*w – (i)c*); and
Evaluation of Data Collection	1.7.10 evaluate the validity and reliability of data collected during fieldwork when drawing conclusions about the methods of data collection and the environment (*w – (ii)d*).

Content	Learning Outcomes
Population Changes	In the context of how science works, students should be able to: 1.7.11 use mathematical models to explain changes in populations and explain the consequences of changes in population density for the environment, to include birth and death rates, emigration and immigration (*w – (i)c*);
Role of Sun as Energy Source	1.7.12 understand that the Sun is the source of energy for most ecosystems on Earth and understand the role of green plants as producers in capturing this energy and making it available to other organisms;
Food Chains and Food Webs	1.7.13 understand food chains and webs and identify producers, consumers and trophic levels;
Pyramids of Numbers and Biomass	1.7.14 construct pyramids of numbers and biomass as models of food chains and explain the difference (*w – (iii)b, (iii)c*), ***and:*** – ***explain the advantages and disadvantages of each type of pyramid; and*** – ***understand the difficulties caused by organisms feeding at two different trophic levels;***
Decomposition	1.7.15 understand the decomposing action of saprophytic fungi and bacteria (*w – (iii)a*): – secretion of enzymes, extracellular digestion and absorption; – in recycling nutrients; – the formation of humus; and – the key features of the decay process;
Energy Flow	1.7.16 use data to interpret and explain decreases in the amount of energy available at each trophic level due to heat from respiration, excretion, egestion and uneaten structures, ***and understand why shorter food chains are more efficient*** (*w – all of (iii)*); and
Carbon Cycle	1.7.17 understand the significance of photosynthesis, respiration, combustion, fossilisation, feeding, excretion, egestion and decomposition within the carbon cycle, and the constant removing and returning of substances from the environment (*w – (iii)a*).

Content	Learning Outcomes
Global Warming	In the context of how science works, students should be able to:
	1.7.18 understand that collaborative scientific research suggests that an increase in levels of carbon dioxide leads to global warming and understand the problems associated with this, and realise that there is controversy associated with the recording, sources, modelling and possible solutions to this problem;
Acid Rain	1.7.19 explain the causes and effects of acid rain, and strategies to reduce it (*w – (iii)a*);
Reducing Carbon Emissions	1.7.20 ***understand how scientific evidence informs local government about the need to implement policies to bring about:*** ***– reductions in carbon emissions;*** ***– increases in renewable energy; and*** ***– changes in agricultural practices*** (*w – (iv)b*);
Nitrogen Cycle	1.7.21 ***understand the role that microorganisms have in the nitrogen cycle, to include nitrogen fixation, nitrification, de-nitrification and decomposition (knowledge of the names of specific bacteria is not required) and apply this to different growing conditions*** (*w – (iii)a*);
Minerals	1.7.22 understand that plants need nitrates to form proteins and that they obtain these from the soil through root hair cells ***by active uptake***;
	1.7.23 identify root hair cells as specialised cells that are adapted by having an extended shape, providing an increased surface area for increased uptake of water and minerals;
	1.7.24 ***understand that active uptake is a process that requires energy to transport the minerals against a concentration gradient*** (*w – all of (iii)*); and
	1.7.25 understand why growers add minerals to the soil, to include calcium, magnesium and nitrogen, and compare the use of natural fertilisers (farmyard manure and compost) and artificial fertilisers as a means of replacing nitrates in soil (*w – all of (iii)*).

Content	Learning Outcomes
Eutrophication	In the context of how science works, students should be able to: 1.7.26 ***explain how sewage disposal and fertiliser run-off can cause eutrophication in terms of:*** – ***nitrates stimulating growth of aquatic plants and algae;*** – ***the death of aquatic plants and algae due to subsequent nitrate depletion and shading;*** – ***the role of aerobic microorganisms in the decomposition of plants and algae; and*** – ***the consequences of oxygen depletion on other aquatic vertebrates and invertebrates*** (*w – (iv)b*);
Monitoring Environmental Changes	1.7.27 carry out studies or analyse data to monitor environmental changes (*w – (ii)b*), to include: – biotic data, for example lichens as indicator species of air pollution and blood worms as indicator species of water pollution caused by eutrophication; and – abiotic data (carbon dioxide levels, ice density and sea levels); and
International Treaties	1.7.28 outline the role of international treaties in combating pollution (*w – (iv)b*).

3.2 Unit 2: Body Systems, Genetics, Microorganisms and Health

This unit deals with osmosis and plant transport, chromosomes, genes and DNA, cell division and genetics, reproduction, contraception and fertility, applied genetics, variation and selection, circulatory system, microorganisms, defence against disease, medicines and drugs.

Osmosis and Plant Transport

In this section, students investigate the transport of water, minerals and the products of photosynthesis between the cells and organs of a plant. At Higher Tier, cell lysis in animal cells is also explored.

Content	Learning Outcomes
2.1 Osmosis and Plant Transport **Osmosis, Plasmolysis and Turgidity**	In the context of how science works, students should be able to: 2.1.1 carry out investigations, collect data and draw conclusions to demonstrate the process of osmosis (across selectively permeable membranes) in plant tissue, to include: – the change in size and mass of plant tissue (*w – (ii)b, (ii)c, (ii)d*); and – the use of a microscope to identify changes in plant cell structure that occur in plasmolysed and turgid cells due to osmosis (*w – (ii)b*); 2.1.2 explain osmosis as diffusion of water from a dilute solution to a more concentrated solution, through a selectively permeable membrane; 2.1.3 explain how osmosis causes plant cells to become plasmolysed and turgid; 2.1.4 understand the role of the cell wall in limiting the entry of water;
Uses of Water	2.1.5 understand that plants use water for support, transport, transpiration and photosynthesis;
The Potometer	2.1.6 use a potometer (bubble potometer and weighing method) to gain an understanding of the process of transpiration in plants;
Transpiration	2.1.7 define transpiration as evaporation from mesophyll cells followed by diffusion through airspaces and stomata; 2.1.8 investigate the factors affecting the rate of transpiration (wind speed, temperature, surface area and humidity) and analyse data collected to calculate the rate of transpiration; and
Cell Lysis	2.1.9 ***understand the effect of placing red blood cells in water, causing cell lysis.***

Content	Learning Outcomes

Chromosomes, Genes and DNA

In this section, students develop an understanding of the structure and functions of chromosomes, genes and DNA. The development of theories that led to the discovery of the structure of DNA are also addressed.

Content	Learning Outcomes
2.2 Chromosomes, Genes and DNA **Chromosomes**	In the context of how science works, students should be able to: 2.2.1 identify and describe chromosomes as genetic structures in the nucleus of a cell (*w – (iii)a*); 2.2.2 know that chromosomes occur as functional pairs (except in sex cells) (*w – (iii)a*);
Genes	2.2.3 identify and describe genes as sections of chromosomes that operate as functional units to control characteristics (*w – (iii)a*); 2.2.4 know that genes are short lengths of DNA (*w – (iii)a*);
DNA Structure	2.2.5 understand the structure of DNA (*w – (iii)a*), to include: – a phosphate and sugar (deoxyribose) backbone with interlinking bases to form a double helix; – base pairing rules and the unique nature of an individual's DNA; and – ***the link between the DNA code and the building up of amino acids in the correct sequence to form protein – the base triplet hypothesis (transcription and translation not required);***
Discovery of DNA Structure	2.2.6 ***describe (in outline only) how the work of Chargaff, Franklin and Wilkins, and Watson and Crick, using different lines of evidence, led to the discovery of the structure of DNA*** (*w – (i)c, (iii)b, (iv)c*); and 2.2.7 ***know that the development of the scientific theory of the structure of DNA is an example of the collaborative nature of science, that many scientific theories are developed in stages using different lines of evidence, and how new scientific knowledge is validated (for example peer review).***

Cell Division and Genetics

In this section, students learn about the processes of cell division and monohybrid genetics. Cancer, which is due to uncontrolled cell division, is also included in this section.

Content	Learning Outcomes
2.3 Cell Division and Genetics **Measuring Growth**	In the context of how science works, students should be able to: 2.3.1 use secondary data to investigate the growth of humans (height and mass), and understand the advantages and disadvantages of other measurements of growth, to include cell length, number of cells and dry mass (*w – (ii)b, (iii)b*);
Mitosis	2.3.2 understand that mitosis allows organisms to grow, to replace worn out cells and to repair damaged tissue; 2.3.3 outline mitosis in terms of the exact duplication of chromosomes producing daughter cells that are genetically identical to parent cells (clones) – names of phases and details of DNA replication not required; 2.3.4 ***know that asexual reproduction in plants results in genetically identical offspring (clones) illustrated by tissue culture (in outline only);***
Cancer	2.3.5 understand that cancer cells are produced by uncontrolled cell division, which can result in two types of tumour – benign (encapsulated and not spreading) and malignant (capable of spreading) (*w – (iii)a*); 2.3.6 research secondary sources to examine the incidences of lung, skin and cervical cancer in Northern Ireland (*w – (ii)b, (ii)d*); 2.3.7 understand the causes of cancer: – radiation – UV radiation only; – chemicals – smoking only; and – viruses – Human Papilloma Virus only; 2.3.8 understand the importance of early detection in improving the survival rate of cancer patients – screening programmes for breast, cervical, testicular and skin cancer (*w – (iv)a*); and 2.3.9 know various treatment methods for cancer – surgery, radiotherapy and chemotherapy (*w – (iii)a*).

Content	Learning Outcomes
Meiosis	In the context of how science works, students should be able to: 2.3.10 understand meiosis as reduction division (one cell producing four genetically different, haploid daughter cells) ***and as a process which, through independent assortment, reassorts the chromosomes to provide variation (crossing over and the stages of meiosis are not required)*** (*w – (iii)a*);
Fertilisation	2.3.11 understand fertilisation as a means of restoring the diploid number and combining different sets of chromosomes (*w – (iii)a*);
Genetic Diagrams and Terminology	2.3.12 understand and interpret genetic diagrams consisting of a single characteristic controlled by a single gene with two alleles (monohybrid cross) in plants, animals and humans (*w – all of (iii)*): – dominant and recessive alleles; – genotype, phenotype, gamete and offspring ratios, percentages and probabilities; – homozygous and heterozygous genotypes; – Punnett squares to determine genotype frequencies; – ***test (back) crosses to determine an unknown genotype;*** and – ***pedigree diagrams*** (*w – all of (iii)*);
The X and Y Chromosomes	2.3.13 understand how sex is determined in humans; and 2.3.14 ***understand and explain how some genetic disorders are sex linked (the inheritance of haemophilia and red/green colour blindness)*** (*w – all of (iii)*).

Reproduction, Fertility and Contraception

In this section, students develop their understanding of the structures and functions of the parts of the human reproductive system and contraception as a mechanism for preventing pregnancy. Developments in treatment for infertility are also addressed.

Content	Learning Outcomes
2.4 Reproduction, Fertility and Contraception **Sperm Formation and Pregnancy**	In the context of how science works, students should be able to: 2.4.1 know that: – sperm cells are specialised cells formed by meiosis, followed by differentiation in the testes under the influence of the hormone testosterone; – sperm cells are adapted to their function by having a haploid nucleus and a tail for swimming; – fertilisation takes place in the oviducts when the sperm and the haploid egg nucleus fuse to give a diploid zygote; – the zygote divides by mitosis many times to form a ball of cells as it travels down the oviduct to the uterus; – after implantation in the uterus lining it then differentiates to produce a variety of tissues and organs; – the placenta is adapted for diffusion by having a large surface area for exchange of dissolved nutrients, oxygen, carbon dioxide and urea ***and explain the role of villi in providing these adaptations;*** – these substances are carried to or from the foetus in the blood vessels in the umbilical cord; and – the amnion and amniotic fluid cushion the foetus;
Sex Hormones	2.4.2 know that testosterone (produced by the testes) and oestrogen (produced by the ovaries) are sex hormones and recall the secondary sexual characteristics they cause to develop;
Menstrual Cycle	2.4.3 describe the events of the menstrual cycle – menstruation, ovulation and the period when fertilisation is most likely to occur;
Infertility	2.4.4 explain some of the causes of infertility and developments in fertility treatment (*w – (iv)a*): – the use of hormones to produce multiple ova; – in vitro fertilisation; and – the transfer of several embryos into the uterus; and 2.4.5 understand some of the controversy associated with these techniques and their ethical implications (*w – (iv)a, (iv)b*).

Content	Learning Outcomes
Contraception	In the context of how science works, students should be able to: 2.4.6 examine how different methods of contraception work and evaluate the advantages and disadvantages of each (*w – (iv)a, (iv)b*), to include: – mechanical – the condom as a barrier to prevent the passage of sperm and also prevent the spread of sexually transmitted infections, some of which can lead to infertility if left untreated (gonorrhoea, chlamydia and HIV leading to AIDS); – chemical – the contraceptive pill that changes hormone levels and stops the development of the ovum; – surgical – male and female sterilisation to prevent the passage of sperm and ova respectively; and – an awareness that contraception can raise ethical issues for some people.

Applied Genetics

In this section, students understand that mutations can occur in genetic codes during copying, and they investigate the opportunities and moral issues that are linked to our developing understanding in this area. They also explore the process of genetic engineering.

Content	Learning Outcomes
2.5 Applied Genetics	In the context of how science works, students should be able to: 2.5.1 recall that cystic fibrosis is an inherited disease;
Mutations	2.5.2 understand that mutations are random changes in the: – number of chromosomes (Down Syndrome); or – structure of genes ***(haemophilia)*** and can be triggered by environmental factors, such as UV light causing skin cancer; and
Genetic Screening	2.5.3 understand the principles of genetic screening and be aware of the ethical issues it raises (*w – (iv)b*), to include: – the dilemma for carriers of genetic conditions in becoming pregnant; and – abortion following diagnosis of abnormalities after amniocentesis or other tests.

Content	Learning Outcomes
Genetic Engineering	In the context of how science works, students should be able to: 2.5.4 understand genetic engineering (*w – all of (iii)*), to include: – the basic techniques used to produce human insulin (for the treatment of diabetes) – transfer of a human insulin gene into a plasmid of a bacterial cell to form a genetically modified bacterium which can then be cultured in a fermenter to produce human insulin; – ***the use of restriction enzymes to produce 'sticky ends';*** – the need for downstreaming (extraction, purification and packaging) to produce a pure form of insulin which can be used to treat diabetics; and – the advantages of producing human insulin (and other products) by this method (*w – (iv)a, (iv)b*), exemplifying how and why decisions about science are made.

Variation and Selection

In this section students develop an understanding of the nature of variation in living organisms and the relationship between variation and selection.

Content	Learning Outcomes
2.6 Variation and Selection **Types of Variation**	In the context of how science works, students should be able to: 2.6.1 investigate variation in living things, display data using appropriate graphical techniques, and evaluate the validity and reliability of the data (*w – all of (i), all of (ii)*), to include: – height and mass as examples of continuous variation (histogram) *(w – (iii)c*); and – tongue rolling and ABO blood groups as examples of discontinuous variation (bar chart) (*w – (iii)c*); and 2.6.2 understand that variation in living organisms has both a genetic and an environmental basis (for example height in humans) (*w – (iii)a*).

Content	Learning Outcomes
Natural Selection	In the context of how science works, students should be able to: 2.6.3 understand how variation and selection may lead to evolution or extinction (*w – (iii)a*), to include: – natural selection as variation within phenotypes and competition for resources often leading to differential survival, for example antibiotic resistance; – survival of the fittest in terms of those best adapted being more likely to survive to reproduce and pass on their genes to the next generation, using this model to explain secondary data; – the possibility of failure to adapt resulting in extinction of a species over time; and – ***the relationship between natural selection and evolution as a continuing process which leads to gradual changes in organisms over time.***

Circulatory System

In this section, students investigate the components of the circulatory system, their functions and the effect of exercise on the system.

Content	Learning Outcomes
2.7 Circulatory System **Blood Components**	In the context of how science works, students should be able to: 2.7.1 use a microscope to examine a blood smear, identify the component parts and understand their function (*w – all of (ii), (iii)a*): – red cells – a specialised cell adapted to oxygen transport – biconcave shape, absence of nucleus and haemoglobin containing iron; – white cells – defence against disease; – platelets – the role in the conversion of fibrinogen to fibrin, causing blood clotting and scab formation; and – plasma – transport of cells, food molecules, carbon dioxide, hormones and urea; and 2.7.2 ***understand the causes and symptoms of anaemia due to changes in the levels of specific blood components*** (*w – all of (iii)*).

Content	Learning Outcomes
Blood Donation	In the context of how science works, students should be able to:
	2.7.3 understand the need for blood donation and transfusions to treat blood disorders;
	2.7.4 ***use secondary data to investigate the number of blood donors in Northern Ireland and suggest reasons why there is a shortage, to include the ethical implications for some groups*** (*w – (i)b, (i)c, (ii)b, (ii)d, (iv)b*);
Blood Vessels	2.7.5 use a microscope to examine blood vessels and relate their structure to their functions – arteries, veins and capillaries in terms of: – wall thickness; – presence of muscle and elastic fibres; – blood pressure; – valves; and – the nature and direction of blood flow (*w – (ii)b, (ii)c, (iii)a*);
	2.7.6 know the names and functions of blood vessels entering and leaving the heart, lungs, liver, kidneys, intestine ***and brain (carotid arteries and jugular veins only)*** and describe the sequence and direction of flow in terms of a double circulation of oxygenated and deoxygenated blood (*w – (iii)a*);
Effects of Exercise	2.7.7 investigate the effects of exercise on the pulse rate and know how the circulatory system benefits from regular exercise – strengthened heart muscle and increased cardiac output when at rest (*w – all of (ii)*); and
The Heart	2.7.8 examine the heart and relate its structures to the function of a unidirectional pump, to include identifying the four chambers, valves, thickness of muscle wall and coronary blood vessels (*w – (iii)a*).

Content	Learning Outcomes
Heart Attacks and Strokes	In the context of how science works, students should be able to: 2.7.9 understand the cause and effect of a blockage in a blood vessel (*w – (iii)a*): – a blockage caused by a build-up of cholesterol deposits leads to clot formation; – restricted blood flow means less oxygen and glucose reaching cells, and the resulting reduced cell respiration leads to cell death; – a blockage in the coronary blood vessels restricts blood flow to the heart muscle and causes death of heart muscle cells (heart attack); and – a blockage in the blood vessels to the brain causes death of brain cells, resulting in reduced brain function (stroke); 2.7.10 understand that certain factors increase or reduce the risk of heart disease and strokes (excess dietary fats, smoking, lack of exercise and stress), and interpret secondary data to evaluate the risk factors that can contribute to circulatory disorders (heart disease and stroke) (*w – (i)a, (ii)b, (ii)c, (ii)d*); and
Plasma, Tissue Fluid and Lymph	2.7.11 ***understand the relationship between plasma, tissue fluid and lymph*** (*w – (iii)a, (iii)b*).

Microorganisms, Defence against Disease, Medicines and Drugs

In this section, students investigate how diseases are caused by microorganisms, the role and development of medicines in combating disease and the adverse effects of misusing drugs.

Content	Learning Outcomes
2.8 Microorganisms, Defence against Disease, Medicines and Drugs **Types of Microorganisms**	In the context of how science works, students should be able to: 2.8.1 understand the role of Pasteur's Swan Neck experiment in refuting earlier theories about spontaneous generation and developing pasteurisation techniques (*w – (iv)b, (iv)c*); 2.8.2 know the types of disease-causing microorganisms and how they are spread, prevented and treated (*w – (iii)a*), including: – bacteria (gonorrhoea, chlamydia, salmonella and tuberculosis); – viruses (HIV leading to AIDS, cold and flu, mumps, measles, polio and rubella); and – fungi (athlete's foot); and
The Body's Defence Mechanisms	2.8.3 understand the defence mechanisms of the body (*w – (iii)a*), to include: – the skin, mucous membranes and blood clotting; – the production of antibodies by white blood cells (lymphocytes) in response to antigens; – the role of antibodies in defence – antibody-antigen reaction, clumping, reduced spread of disease microorganism and symptoms; – the role of phagocytes in engulfing and digesting microorganisms; – ***the role of memory lymphocytes in a secondary response;*** and – immunity, in terms of: natural – innate and acquired; and artificial – active and passive.

Content	Learning Outcomes
Vaccinations	In the context of how science works, students should be able to: 2.8.4 understand the role of vaccines, to include: – ***the use of modified disease-causing organisms to produce raised antibody levels and memory lymphocyte levels in the blood*** (*w – (iii)a*); – ***the role of booster vaccinations and the interpretation of graphs of blood antibody levels*** (*w – (iii)b, (iii)c*); – the development of the first vaccination by Jenner as an example of how scientific understanding and theories develop (*w – all of (iv)*); and – the importance of immunisation when travelling to certain countries (specific details of immunisation programmes are not required);
Antibiotics	2.8.5 understand that antibiotics, for example penicillin, are chemicals produced by fungi which are used against bacterial diseases to kill bacteria or reduce their growth (*w – (iii)a*);
Antibiotic-Resistant Bacteria	2.8.6 understand the implications of the following on the health of the population (*w – (iv)a*): – ***overuse of antibiotics leading to bacterial resistance, resulting in the development of 'superbugs' such as MRSA;*** and – procedures used to reduce the incidence of 'superbugs' and why their eradication is difficult; 2.8.7 ***use secondary data to evaluate the effectiveness of measures that have been introduced to reduce the number of infections caused by antibiotic-resistant bacteria*** (*w – (ii)b, (ii)d, all of (iii)*); and
Aseptic Techniques	2.8.8 safely use aseptic techniques to inoculate, plate and incubate bacteria and investigate the effect of different antibiotics on their growth (*w – all of (ii)*).

Content	Learning Outcomes
Development of Medicines	In the context of how science works, students should be able to: 2.8.9 understand how medicines are developed (*w – all of (iv)*), to include: – the discovery of penicillin by Fleming and its later development for medical applications by Florey and Chain, illustrating the collaborative nature of science; – the role of careful observation and scientific process in the development of this antibiotic; and – ***the manufacture of drugs (penicillin) in a simple fermenter;***
Alcohol, Tobacco and Drugs	2.8.10 understand how drugs may be used or misused: – alcohol and its effects on the individual and society: binge drinking; and the effect of drinking on the development of the foetus; – tobacco smoke: tar – cause of bronchitis (narrowing of bronchi and bronchioles), emphysema (damage to alveoli reducing the surface area for gas exchange) and lung cancer (abnormal cell division); nicotine – addictive and affects heart rate; and carbon monoxide – combines with red blood cells to reduce the oxygen-carrying capacity of the blood; and – the effects of cannabis and cocaine on the individual and society;
Legislation	2.8.11 understand how scientific evidence about the use and misuse of some of the drugs listed contributes to changes in legislation in areas such as smoking bans, licensing regulations for bars and clubs, and the legal position of cannabis (*w – (iv)c*); and
Effects of Legislation	2.8.12 collect data from secondary sources on the results of the ban on smoking in relation to the incidence of lung cancer (*w – (i)a, (i)b*).

3.3 Unit 3: Practical Skills

This controlled assessment unit makes up 25 percent of the qualification. The acquisition and development of the skills needed for controlled assessment should form part of normal classroom teaching and learning. They should be an integral part of teachers' schemes of work.

We set two controlled assessment tasks for each cohort of students. We renew these each year. **Students may attempt one or both of the tasks.** If they attempt both tasks, they will achieve the higher of their two marks as their overall mark for the unit.

Teachers may assess students' performance in the controlled assessment task at any time during the course. At the centre's discretion, assessment may occur as part of normal class routine or in a set time block. It is not necessary to assess all students at the same time, even if they are carrying out the same controlled assessment task.

Although teachers can give students feedback on the results of assessments, they should inform the students that their marks may change as a result of moderation.

Each controlled assessment task has three parts:

- Part A – Planning and Risk Assessment
- Part B – Data Collection
- Part C – Processing, Analysis and Evaluation.

Part A – Planning and Risk Assessment

In Part A of the controlled assessment task, students develop a hypothesis and plan an experimental method to investigate that hypothesis. They draw a blank results table to record and process their evidence, and they carry out a risk assessment. Students should complete this part of the task in **Candidate Response Booklet A**.

Students carry out Part A under a **medium (informal)** level of control, and teachers assess it using generic marking criteria that we provide (see Section 6). The maximum mark is 18.

Before beginning this part of the controlled assessment task, teachers must refer to the controlled assessment task and our teacher guidance notes.

Content	Learning Outcomes
Planning and Risk Assessment	Students should be able to: • develop a hypothesis that they are going to investigate; • plan a practical experiment to test the hypothesis, including a risk assessment; and • draw a blank results table for recording and processing their data or observations.

Part B – Data Collection

In Part B, students are required to collect data safely while managing any risks they identified in Part A. They record the data in the blank results table they drew in Candidate Response Booklet A.

Because the acquisition and development of the skills that students need for this stage should form part of normal classroom teaching and learning, students taking the controlled assessment task should have had ample opportunity to practise the safe use of scientific techniques for collecting data.

Students carry out this part of the task under a **low (limited)** level of control; there is no assessment.

Content	Learning Outcomes
Data Collection	Students should be able to: • carry out the experimental part of an investigation safely; and • collect sufficient data to complete a blank results table.

Part C – Processing, Analysis and Evaluation

In Part C, students must answer a number of compulsory questions that relate directly to their own work and to secondary data supplied.

The questions appear in **Candidate Response Booklet B**, and students must complete all their answers in this booklet. Extra lined paper and graph paper can be made available on request.

There is a **high (formal)** level of control for this stage of the controlled assessment task: it is assessed. The maximum mark is 27.

Content	Learning Outcomes
Processing, Analysis and Evaluation	Students should be able to: • answer a number of compulsory questions relating directly to their own work and to secondary data supplied; • demonstrate their scientific knowledge and understanding; and • process, analyse and evaluate the work they have completed, the data they recorded in Candidate Response Booklet A, and secondary data supplied.

3.4 Mathematical Content

Students need to be familiar with and competent in the following areas of mathematics in order to develop their skills, knowledge and understanding in biology:

Students should be able to:

- understand number, size and scale and the quantitative relationship between units;
- understand when and how to use estimation;
- carry out calculations involving +, - , ×, ÷, either singly or in combination, decimals, fractions, percentages and positive whole number powers;
- provide answers to calculations to an appropriate number of significant figures;
- understand and use the symbols =, <, >, ~ ;
- understand and use direct proportion and simple ratios;
- calculate arithmetic means;
- understand and use common measures and simple compound measures such as speed;
- plot and draw graphs (line graphs, bar charts, pie charts, scatter graphs, histograms), selecting appropriate scales for the axes;
- substitute numerical values into simple formulae and equations using appropriate units;
- translate information between graphical and numeric form;
- extract and interpret information from charts, graphs and tables;
- understand the idea of probability; and
- calculate area, perimeters and volumes of simple shapes.

In addition, **Higher Tier** students should be able to:

- ***interpret, order and calculate with numbers written in standard form;***
- ***carry out calculations involving negative powers (only -1 for rate);***
- ***change the subject of an equation;***
- ***understand and use inverse proportion; and***
- ***understand and use percentiles and deciles.***

Students can use calculators in all assessments.

Students are expected to know and use the appropriate units for all the quantities specified. However, they will not necessarily gain credit for the appropriate use of units in assessment questions.

4 Scheme of Assessment

4.1 Assessment opportunities

The availability of examinations and controlled assessment appears in Section 2 of this specification.

Candidates studying unitised GCSE qualifications must complete at least 40 percent of the overall assessment requirements as terminal assessment.

Candidates may resit each individual assessment unit once. If candidates resit a unit, they are free to count the better of the two marks they achieve **unless** the resit makes up part of their 40 percent terminal assessment. If the resit **does** make up part of the terminal assessment, the resit mark will count towards the final grade, even if there is a better score for an earlier attempt.

Please note that for this specification, Unit 3 (controlled assessment) counts towards the 40 percent terminal requirement.

Results for individual assessment units remain available to count towards a GCSE qualification until we withdraw the specification.

4.2 Assessment objectives

Below are the assessment objectives for this specification. Candidates must:

AO1	Recall, select and communicate their knowledge and understanding of biology
AO2	Apply skills, knowledge and understanding of biology in practical and other contexts
AO3	Analyse and evaluate evidence, make reasoned judgements and draw conclusions based on evidence.

4.3 Assessment objective weightings

The table below sets out the assessment objective weightings for each examination component and the overall GCSE qualification:

Assessment Component	Nature of Assessment	Assessment Objectives			Component Weighting
		AO1	AO2	AO3	
Unit 1	External	16%	12%	7%	35%
Unit 2	External	18%	14%	8%	40%
Unit 3	Internal Controlled assessment	–	12%	13%	25%
Total		34%	38%	28%	100%

4.4 Quality of written communication

In GCSE Biology, candidates must demonstrate their quality of written communication (QWC). In particular, they must:

- ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear;
- select and use a form and style of writing appropriate to their purpose and to complex subject matter; and
- organise information clearly and coherently, using specialist vocabulary where appropriate.

Examiners and teachers assess the quality of candidates' written communication in their responses to questions or tasks that require extended writing.

4.5 Reporting and grading

We award GCSE qualifications on an eight grade scale A*–G, with A* being the highest. For candidates who fail to attain a grade G, we report their results as unclassified (U).

We report the results of individual assessment units on a uniform mark scale that reflects the assessment weighting of each unit. The maximum uniform marks available to candidates entered for the Higher Tier of a unit will be the maximum uniform mark available for that unit. The maximum marks available to candidates entered for the Foundation Tier of a unit will be the maximum uniform mark available for the notional grade C on that unit (the notional grade B minus one uniform mark).

We determine the grades awarded by aggregating the uniform marks obtained on individual assessment units.

The grades we award match the grade descriptions published by the regulatory authorities (see Section 5).

Unit results

Unit 1

There are 80 raw marks available at Foundation Tier and 100 at Higher Tier.

The **maximum** uniform mark for Unit 1 is 140. The **minimum** uniform mark required for each grade is as follows:

A*	A	B	C	D	E	F	G
126	112	98	84	70	56	42	28

Candidates entering for Foundation Tier can achieve a maximum uniform mark score of 97 in this unit.

Unit 2
There are 90 raw marks available at Foundation Tier and 115 at Higher Tier.

The **maximum** uniform mark for Unit 2 is 160. The **minimum** uniform mark required for each grade is as follows:

A*	A	B	C	D	E	F	G
144	128	112	96	80	64	48	32

Candidates entering for Foundation Tier can achieve a maximum uniform mark score of 111 in this unit.

Unit 3 (Controlled assessment)
The **maximum** uniform mark for Unit 3 is 100. The **minimum** uniform mark required for each grade is as follows:

A*	A	B	C	D	E	F	G
90	80	70	60	50	40	30	20

Qualification results

The **maximum** uniform mark for the final award is 400. The **minimum** uniform mark required for each final grade is as follows:

A*	A	B	C	D	E	F	G
360	320	280	240	200	160	120	80

5 Grade Descriptions

Grade descriptions are provided to give a general indication of the standards of achievement likely to have been shown by candidates awarded particular grades. The descriptions must be interpreted in relation to the content in the specification; they are not designed to define that content.

The grade awarded will depend in practice upon the extent to which the candidate has met the assessment objectives overall. Shortcomings in some aspects of candidates' performance in the assessment may be balanced by better performances in others.

Grade	Description
A	Candidates recall, select and communicate precise knowledge and detailed understanding of biology. They demonstrate a comprehensive understanding of the nature of biology, its principles and applications and the relationship between biology and society. They understand the relationships between scientific advances, their ethical implications and the benefits and risks associated with them. They use scientific and technical knowledge, terminology and conventions appropriately and consistently showing a detailed understanding of scale in terms of time, size and space. They apply appropriate skills, including communication, mathematical, technical and observational skills, knowledge and understanding effectively in a wide range of practical and other contexts. They show a comprehensive understanding of the relationships between hypotheses, evidence, theories and explanations and make effective use of models, including mathematical models, to explain abstract ideas, phenomena, events and processes. They use a wide range of appropriate methods, sources of information and data consistently, applying relevant skills to address scientific questions, solve problems and test hypotheses. Candidates analyse, interpret and critically evaluate a broad range of quantitative and qualitative data and information. They evaluate information systematically to develop arguments and explanations taking account of the limitations of the available evidence. They make reasoned judgements consistently and draw detailed, evidence-based conclusions.

Grade	Description
C	Candidates recall, select and communicate secure knowledge and understanding of biology. They demonstrate understanding of the nature of biology and its principles and applications and the relationship between biology and society. They understand that scientific advances may have ethical implications, benefits and risks. They use scientific and technical knowledge, terminology and conventions appropriately, showing understanding of scale in terms of time, size and space. They apply appropriate skills, including communication, mathematical, technical and observational skills, knowledge and understanding in a range of practical and other contexts. They show understanding of the relationships between hypotheses, evidence, theories and explanations and use models, including mathematical models, to describe abstract ideas, phenomena, events and processes. They use a range of appropriate methods, sources of information and data, applying their skills to address scientific questions, solve problems and test hypotheses. Candidates analyse, interpret and evaluate a range of quantitative and qualitative data and information. They understand the limitations of evidence and use evidence and information to develop arguments with supporting explanations. They draw conclusions based on the available evidence.
F	Candidates recall, select and communicate limited knowledge and understanding of biology. They recognise simple inter-relationships between biology and society. They show a limited understanding that scientific advances may have ethical implications, benefits and risks. They use limited scientific and technical knowledge, terminology and conventions, showing some understanding of scale in terms of time, size and space. They apply skills, including limited communication, mathematical, technical and observational skills, knowledge and understanding in practical and some other contexts. They recognise and use hypotheses, evidence and explanations and can explain straightforward models of phenomena, events and processes. They use a limited range of methods, sources of information and data to address straightforward scientific questions, problems and hypotheses. Candidates interpret and evaluate limited quantitative and qualitative data and information from a narrow range of sources. They can draw elementary conclusions having collected limited evidence.

6 Guidance on Controlled Assessment

6.1 Controlled assessment review

We replace our controlled assessment tasks every year to ensure that they continue to set appropriate challenges and at the same time remain valid, relevant and stimulating to encourage candidates to achieve their true potential.

6.2 Skills assessed by controlled assessment

The controlled assessment tasks draw on candidates' ability to:

- develop hypotheses and plan practical ways to test them, including risk assessment;
- collect data while managing any associated risks;
- process, analyse and interpret primary and secondary data;
- draw evidence-based conclusions;
- review and evaluate methods of data collection and the quality of the resulting data; and
- review hypotheses in light of outcomes.

6.3 Levels of control

The rules for controlled assessment in GCSE Sciences are defined for the three stages of the assessment:

- Task setting;
- Task taking; and
- Task marking.

The purpose of the controls is to ensure the validity and reliability of the assessment and to enable teachers to confidently authenticate candidates' work.

6.4 Task setting

The level of control for task setting is **high**. We set two comparable tasks for each cohort of students. We renew these each year. Candidates may sit one or both of the controlled assessment tasks. However, they cannot take a specific task more than once.

We supply the controlled assessment tasks, along with teacher guidance notes, in September each year. Centres must keep these in a secure place, for example a locked metal filing cabinet. Even when candidates' work is under way, they must not be allowed to take their Candidate Response Booklets with them after class; these must be stored securely at all times.

A centre may choose to contextualise the task that we have set if, for example, the centre lacks availability and access to the resources required. However, this must not change the nature of the task; all candidates must carry out the task that we have set.

6.5 Task taking

Part A – Planning and Risk Assessment

This part of the controlled assessment task is carried out under a **medium (informal)** level of control. Teachers assess it using marking criteria that we provide.

Area of Control	Detail of Control
Authenticity	Candidates must complete their Planning and Risk Assessment under medium (informal) supervision. **They must complete all work that is to be submitted in Candidate Response Booklet A.** They must not remove work that they have completed in Candidate Response Booklet A from the classroom. If a candidate fails to complete all sections of the booklet in one sitting, the teacher should collect the work, store it in a secure place and return it to the candidate at the beginning of the next session.
Feedback	Teachers may discuss aspects of the task in general terms with the candidates. This discussion should not be too specific, as candidates must make their own planning decisions. Teachers may also discuss with candidates, in general terms, the skills required to reach maximum marks in each of the bands in the generic mark schemes for planning and risk assessment. Candidates may also carry out a trial of their proposed method using any apparatus they might need.
Time Limit	There is no time limit for the planning and risk assessment phase of the task.
Collaboration	Before documenting their planning and risk assessment activities in Candidate Response Booklet A, candidates may discuss aspects of the task as a class and/or in small groups (of up to three). Candidates can also carry out trials with any apparatus/ equipment individually or in small groups of up to three. However, when completing their work in Candidate Response Booklet A, candidates must work individually. It is the responsibility of the teacher to ensure that any assessable outcomes can be attributed to individual candidates.

Area of Control	Detail of Control
Resources	When carrying out a trial of their investigation, candidates may have access to any practical apparatus/equipment available to the centre. Teachers must guide and supervise them to ensure that they comply with the necessary health and safety requirements. Candidates may have access to their notes, textbooks and the internet during the planning and risk assessment stage of the task. As QWC is assessed in this part of the controlled assessment task, they are not allowed access to dictionaries, spell checks and grammar facilities. This includes online or electronic versions.

Part B – Data Collection

There is a **low (limited)** level of control for this stage of the controlled assessment task; it is not assessed.

Area of Control	Detail of Control
Authenticity	Candidates must complete this stage of the controlled assessment task under limited supervision. Teachers must supervise to ensure that candidates comply with the necessary health and safety requirements.
Feedback	Significant teacher guidance is permitted during the data collection stage: teachers can give help to candidates just as they would during any teaching and learning situation. However, they must avoid giving answers to questions that appear in the assessed Processing, Analysis and Evaluation stage of the assessment (Part C).
Time Limit	There is no time limit for the data collection part of the assessment.
Collaboration	As the work of individual candidates can be informed by working with others, candidates may carry out their data collection either individually or in small groups of up to three (ideally groups of two). It is a requirement that each individual candidate makes an active contribution to carrying out the experiment and collecting data. If one candidate in a group refuses to participate in the data collection process, that candidate should not be permitted to take the assessed Part C of the task.

Area of Control	Detail of Control
Resources	Candidates must have access to their Candidate Response Booklet A containing: • their plan and risk assessment; and • the blank results table they need to record their data. Candidates may have access to any practical apparatus/ equipment available to the centre. Teachers must supervise them to ensure that they comply with the necessary health and safety requirements.

Part C – Processing, Analysis and Evaluation

There is a **high (formal)** level of control for this stage of the controlled assessment task.

Area of Control	Detail of Control
Authenticity	This stage of the controlled assessment task must take place under formal supervision. Candidates must complete all work under the direct supervision of a teacher. All work must be completed in Candidate Response Booklet B.
Feedback	Teachers must not give any assistance during this stage.
Time Limit	The maximum time allowed for the completion of Part C is **1 hour**, and **candidates must complete it in one sitting**.
Collaboration	Candidates must work independently. They must not communicate with each other during this phase.
Resources	Candidates must have access to the work they completed in their Candidate Response Booklet A. They must not use other pre-prepared materials or have access to the internet, email or portable memory devices. They may, however, use calculators.

6.6 Task marking

The level of control for task marking is **medium**.

A candidate's final mark must be based on only one controlled assessment task. **If a candidate has attempted both of the tasks we set, their overall mark for the unit is the mark they achieved in the higher scoring task.**

Candidates must not attempt a controlled assessment task more than once.

Part A – Planning and Risk Assessment

Teachers mark the candidates' planning and risk assessment work using the generic marking criteria shown in this section.

They must view the planning and risk assessment work submitted in Candidate Response Booklet A as candidates' **final** piece of work and mark it accordingly. **Teachers must not return this work to candidates for redrafting.**

Generic Marking Criteria for Part A: Planning

Band	Descriptor	Increasing complexity of method
(0 marks)	A mark of **zero** must be awarded for work not worthy of credit.	↓
Band 1 **(1–4 marks)**	Making little or no use of appropriate specialist terms, candidates state simply what they hope to find out in the investigation. They develop a simple plan to collect and record a limited amount of appropriate evidence. They identify a key factor to vary and select suitable equipment/apparatus. They identify an area in the investigation that could reduce the reliability of the data/evidence collected. The form, style, spelling, grammar and punctuation are of a limited standard.	
Band 2 **(5–8 marks)**	Using some appropriate specialist terms, candidates develop a hypothesis, with scientific reasoning, as to the outcomes of the investigation. They develop a plan, with some degree of complexity, to collect and record a significant amount of appropriate evidence. They identify key factors to investigate and measure/observe and select suitable equipment/apparatus. They identify areas in the investigation that could affect the reliability of the data/evidence collected and explain the steps taken to ensure its reliability. The form, style, spelling, grammar and punctuation are of a satisfactory standard.	
Band 3 **(9–12 marks)**	Using appropriate specialist terms throughout, candidates develop a hypothesis, with detailed scientific reasoning, as to the outcomes of the investigation. They develop a complex plan to collect and record a wide range of appropriate evidence. They identify key factors to investigate, measure/observe and control and select suitable equipment/apparatus. They discuss, in detail, areas of the investigation that could affect the reliability of the data/evidence collected and the steps taken to ensure its reliability. They explain their strategies to deal with anomalous results/observations. The form, style, spelling, grammar and punctuation are of a high standard.	

Generic Marking Criteria for Part A: Risk Assessment

Band	Descriptor
(0 marks)	A mark of **zero** must be awarded for work not worthy of credit.
Band 1 **(1–2 marks)**	Candidates state a safety hazard specific to the investigation and state briefly the hazardous outcomes that may result.
Band 2 **(3–4 marks)**	Candidates identify some of the safety hazards specific to the chosen investigation and explain the hazardous outcomes. They state the steps needed to minimise these risks.
Band 3 **(5–6 marks)**	Candidates identify all the safety hazards specific to the chosen investigation and explain in detail both the hazardous outcomes and the steps needed to minimise these risks.

It is up to the **professional judgement** of the teacher to decide which mark descriptors best apply and hence what mark to award for a particular skill.

Teachers should award zero marks only in the unlikely event of a candidate's work not being worthy of any credit.

Teachers should lightly annotate candidates' work to assist moderation. The annotation should be brief but must highlight any aspects of the work that meet the key requirements of a particular mark band.

After marking the candidates' planning and risk assessment work, the teacher has three options to allow the candidate to move forward in the investigation:

Scenario	Action by Teacher
1 **The candidate's plan and risk assessment are deemed to be appropriate.**	Instruct the candidate to use their proposed plan and risk assessment to collect the required data/evidence.
2 **The candidate's plan and risk assessment are, with some minor amendment suggested by the teacher, deemed to be appropriate.**	Amend the candidate's plan and risk assessment, and return it to the candidate. Relay any amendments to them both verbally and in writing. Then instruct the candidate to collect the required data/evidence using the amended plan and risk assessment.
3 **The candidate's plan and risk assessment are deemed to be unsuitable and inappropriate.**	Give an alternative plan and risk assessment to the candidate, and instruct them to collect the required data/evidence using this teacher's plan.

Teachers must ensure that the work they are marking is the candidate's own. They must sign a declaration on their Candidate Response Booklet A certifying that all of the work the candidate has submitted for assessment is their own and has been done in accordance with our controlled assessment regulations. Candidates must also sign the front of their Candidate Response Booklet A.

Part C – Processing, Analysis and Evaluation

Teachers mark candidates' work in Part C, adhering closely to the marking guidelines that we supply. They should use red ink to place marks in the right-hand margin of each Candidate Response Booklet B, then transfer the total for each question to the front cover.

Teacher judgement is sometimes necessary to determine if a candidate deserves a mark. If at a particular point it is not clear why they have awarded a mark, they should add a brief note to explain. This will show the external moderator why the teacher felt the candidate had earned the mark.

Teachers must ensure that the work they are marking is the candidate's own. They must sign a declaration on the Candidate Response Booklet B certifying that all of the work the candidate has submitted for assessment is their own and has been done in accordance with our controlled assessment regulations. Candidates must also sign the front of the Candidate Response Booklet B.

For up-to-date advice on plagiarism or any other incident in which candidate malpractice is suspected, please refer to the Joint Council for Qualifications' *Suspected Malpractice in Examinations and Assessments: Policies and Procedures* on the JCQ website at www.jcq.org.uk

Recording assessment

Centres should complete the Candidate Record Sheet (CRS) for each candidate, including:

- the title of the controlled assessment task;
- a short description of the method used; and
- the overall mark for the highest scoring controlled assessment task for that candidate.

The teacher and candidate declaration on each form must be signed.

Agreement trials and support

We conduct agreement trials each year, where we brief teachers on how to apply the marking guidelines and they engage in trial marking.

We also issue supplementary training materials to all centres in the form of advice on assessment and exemplar materials.

6.7 Internal standardisation

Centres in which **two or more** teachers are involved in the marking process must conduct internal standardisation to ensure they apply the marking guidelines consistently. They should select the work of several candidates across teaching groups. Teachers should mark each candidate's work independently, then use the marking guidelines provided to reach agreement on the marks to award. Centres must complete the appropriate documentation (TAC2 form) to confirm that internal standardisation has taken place. The Head of Department must sign the TAC2 form.

6.8 Moderation

Centres must submit their marks and samples to us by May in any year. We may adjust centres' marking. This is to bring the assessment of the candidates' work into line with our agreed standards.

We issue full instructions well in advance of submission on:

- the details of moderation procedures;
- the nature of sampling; and
- the dates by which centres have to submit marks and samples to us.

For each candidate we randomly select for moderation, centres must submit the following documentation:

- the candidate's completed Candidate Response Booklets, A and B (both booklets must be dated and signed by both the teacher and the candidate); and
- the CCEA Candidate Record Sheet (attached to the candidate's work).

We issue blank copies of all of the above documents, along with the controlled assessment tasks and guidance notes for teachers, in September each year.

Teachers and centre staff may contact us at any stage if they require advice, assistance or support regarding any aspect of controlled assessment.

7 Links

7.1 Support

We provide the following resources to support this specification:

- our website;
- a subject microsite within our website;
- specimen papers and mark schemes; and
- a specimen controlled assessment task.

Some support material from the previous specification may also remain useful.

We intend to expand our range of support to include the following:

- past papers;
- mark schemes;
- Chief Examiner's reports;
- Principal Moderator's reports;
- schemes of work;
- Topic Tracker*;
- controlled assessment guidance for teachers;
- student guides;
- centre support visits;
- support days for teachers;
- agreement trials; and
- exemplification of examination performance.

* Topic Tracker allows teachers to produce their own test papers using past paper examination questions, and a mark scheme is generated to match.

You can find our annual support programme of events and materials for Biology on our website at www.ccea.org.uk

7.2 Curriculum objectives

This specification addresses and builds upon the broad curriculum objectives for Northern Ireland, England and Wales. It should help to facilitate the study of biology and related subjects at a more advanced level.

The study of biology can contribute to an understanding of spiritual, moral, ethical, social and cultural issues by promoting an awareness that the practice of science is a co-operative and cumulative activity and that it is subject to social, economic, technological, ethical and cultural influences and limitations.

This study of biology can contribute to an awareness of environmental issues by promoting an understanding that the application of science may be both beneficial and detrimental to the individual, the community and the environment.

A course based on this specification should give students opportunities to:

- acquire a systematic body of scientific knowledge and the skills needed to apply it in new and changing situations in a range of domestic, industrial and environmental contexts;
- acquire an understanding of scientific ideas, how they develop, the factors that may affect their development, and their power and limitations;
- evaluate (in terms of their scientific knowledge and understanding) the benefits and drawbacks of scientific and technological developments, including those related to the environment, personal health and quality of life, and consider ethical issues where appropriate;
- select, organise and present information clearly and logically, using appropriate scientific terms and conventions, and using ICT where appropriate;
- develop their understanding of spiritual, moral, ethical, social, cultural, global and European environmental issues, which are addressed in the following parts of the specification:
  - the impact of diet on personal health and society (1.3.8-1.3.10);
  - population changes (1.7.11);
  - reducing carbon emissions (1.7.20);
  - international treaties to combat pollution (1.7.28);
  - development of new drugs (2.8.9); and
  - alcohol, tobacco and drug use and associated legislation (2.8.10-2.8.12);
- enhance their range of skills in scientific methods of enquiry and the safe use of scientific equipment throughout their practical work, including fieldwork;
- make use of technology effectively; and
- obtain a qualification that will provide a basis for further study of biology or other science-based courses, or entry into employment.

7.3 Key Skills

All three units in this specification provide opportunities for students to develop and generate evidence for assessing the following nationally recognised Key Skills:

- Application of Number
- Communication
- Improving Own Learning and Performance
- Information and Communication Technology
- Problem-Solving
- Working with Others.

You can find details of the current standards and guidance for each of these skills on the CCEA website at www.ccea.org.uk

7.4 Examination entries

Entry codes for this subject and details on how to make entries are available on our Qualifications Administration Handbook microsite, which you can access at www.ccea.org.uk

Alternatively, you can telephone our Examination Entries, Results and Certification team using the contact details provided in this section.

7.5 Equality and inclusion

We have considered the requirements of equalities legislation in developing this specification.

GCSE qualifications often require the assessment of a broad range of competences. This is because they are general qualifications and, as such, prepare students for a wide range of occupations and higher level courses.

The revised GCSE and qualification criteria were reviewed to identify whether any of the competences required by the subject presented a potential barrier to any students with disabilities. If this was the case, the situation was reviewed again to ensure that such competences were included only where essential to the subject. The findings of this process were discussed with disability and equality groups and with people with disabilities.

During the development process, we carried out an equality impact assessment. This was to ensure that we identified any additional potential barriers to equality and inclusion. Where appropriate, we've given consideration to measures to support access and mitigate against barriers.

Reasonable adjustments are made for students with disabilities in order to reduce barriers to accessing assessments. For this reason, very few students will have a complete barrier to any part of the assessment. Students with physical impairment may instruct a practical assistant to set up equipment but may have difficulty in making observations and in manipulating the equipment to carry out the experiment.

Students with a visual impairment may find elements of the assessment difficult, but technology may help visually impaired students to take readings and make observations. Therefore the assessments should not pose a difficulty for these learners.

It is important to note that where access arrangements are permitted, they must not be used in any way that undermines the integrity of the assessment. You can find information on reasonable adjustments in the Joint Council for Qualifications' document *Access Arrangements and Special Consideration: Regulations and Guidance Relating to Candidates Who Are Eligible for Adjustments in Examinations.*

7.6 Contact details

The following list provides contact details for relevant staff members and departments:

- Specification Support Officer: Nuala Braniff
  (telephone: (028) 9026 1200, extension 2292, email: nbraniff@ccea.org.uk)

- Officer with Subject Responsibility: Patricia Quinn
  (telephone: (028) 9026 1200, email: pquinn@ccea.org.uk)

- Examination Entries, Results and Certification
  (telephone: (028) 9026 1262, email: entriesandresults@ccea.org.uk)

- Examiner Recruitment
  (telephone: (028) 9026 1243, email: appointments@ccea.org.uk)

- Distribution (past papers and support materials)
  (telephone: (028) 9026 1242, email: cceadistribution@ccea.org.uk)

- Support Events Administration
  (telephone: (028) 9026 1401, email: events@ccea.org.uk)

- Information Section (including Freedom of Information requests)
  (telephone: (028) 9026 1200, email: info@ccea.org.uk)

- Business Assurance (appeals)
  (telephone: (028) 9026 1244, email: appealsmanager@ccea.org.uk).

Appendix 1

Glossary of Terms for Controlled Assessment Regulations

Term	Definition
Component	A discrete, assessable element within a controlled assessment/qualification that is not itself formally reported and for which the awarding body records the marks May contain one or more tasks
Controlled assessment	A form of internal assessment where the control levels are set for each stage of the assessment process: task setting, task taking, and task marking
External assessment	A form of independent assessment in which question papers, assignments and tasks are set by the awarding body, taken under specified conditions (including detailed supervision and duration) and marked by the awarding body
Formal supervision (High level of control)	The candidate must be in direct sight of the supervisor at all times. Use of resources and interaction with other candidates is tightly prescribed.
Informal supervision (Medium level of control)	Questions/tasks are outlined, the use of resources is not tightly prescribed and assessable outcomes may be informed by group work. Supervision is confined to: • ensuring that the contributions of individual candidates are recorded accurately; and • ensuring that plagiarism does not take place. The supervisor may provide limited guidance to candidates.
Limited supervision (Low level of control)	Requirements are clearly specified, but some work may be completed without direct supervision and will not contribute directly to assessable outcomes.

Term	Definition
Mark scheme	A scheme detailing how credit is to be awarded in relation to a particular unit, component or task Normally characterises acceptable answers or levels of response to questions/tasks or parts of questions/tasks and identifies the amount of credit each attracts May also include information about unacceptable answers
Task	A discrete element of external or controlled assessment that may include examinations, assignments, practical activities and projects
Task marking	Specifies the way in which credit is awarded for candidates' outcomes Involves the use of mark schemes and/or marking criteria produced by the awarding body
Task setting	The specification of the assessment requirements Tasks may be set by awarding bodies and/or teachers, as defined by subject-specific regulations. Teacher-set tasks must be developed in line with awarding body specified requirements.
Task taking	The conditions for candidate support and supervision, and the authentication of candidates' work Task taking may involve different parameters from those used in traditional written examinations. For example, candidates may be allowed supervised access to sources such as the internet.
Unit	The smallest part of a qualification that is formally reported and can be separately certificated May comprise separately assessed components

Revision History Number	Date of Change	Page Number	Change Made
Version 2	31 August 2011	46	Deletion and addition of words in descriptor section.