

IGCSE

Biology

Specification

Edexcel IGCSE in Biology (4BI0)

First examination 2011

Issue 2

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This specification is Issue 2. Key changes are sidelined. We will inform centres of any changes to this issue. The latest issue can be found on the Edexcel website: www.edexcel.com

Acknowledgements

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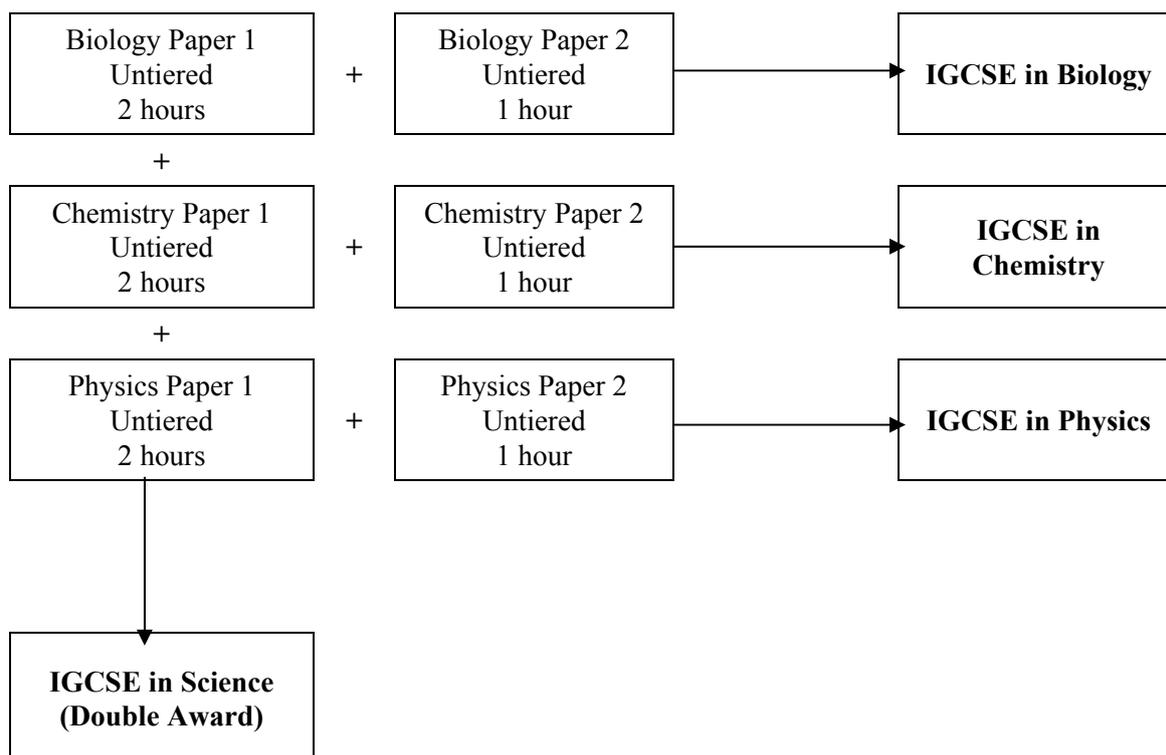
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Introduction

The Edexcel International General Certificate of Secondary Education (IGCSE) in Biology is designed for use in schools and colleges. It is part of the IGCSE suite of science qualifications offered by Edexcel. The course offers students the opportunity to experience biology within the context of their general education. In terms of progression, the design of the course provides a basis of progression to further study in GCE Advanced Subsidiary and Advanced Level Biology.

The relationship of assessment to the qualifications available is shown below.



About this specification

Key features and benefits of the specification

Key features and benefits are:

- includes aspects of science appropriate for the 21st century
- a straightforward linear assessment
- single tier assessment
- assessment of investigative skills through examination
- provides a sound foundation for progression to Edexcel GCE Advanced Subsidiary (AS) and Advanced Level, and other comparable post-16 qualifications.

Key subject aims

The Edexcel IGCSE in Biology enables students to:

- acquire knowledge and understanding of biological facts, concepts and principles
- develop an appreciation of the significance of biological facts, concepts and principles and the skills needed for their use in new and changing situations
- appreciate the importance of accurate experimental work to scientific method and reporting
- form hypotheses and design experiments to test them
- sustain and develop an enjoyment of, and interest in, the study of living organisms
- evaluate, in terms of their biological knowledge and understanding, the benefits and drawbacks of scientific and technological developments, including those related to social, environmental and economic issues.

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Specification at a glance

This Edexcel IGCSE in Biology qualification comprises two externally assessed papers:

- Biology Paper 1
- Biology Paper 2.

Biology Paper 1	Paper code: 4BI0/1B
<ul style="list-style-type: none"> • Externally assessed • Availability: January and June series • First assessment: June 2011 	66% of the total IGCSE marks
<p>Overview of content:</p> <p>Assesses only the content not in bold</p> <ul style="list-style-type: none"> • Section 1: The nature and variety of living organisms • Section 2: Structures and functions in living organisms • Section 3: Reproduction and inheritance • Section 4: Ecology and the environment • Section 5: Use of biological resources 	
<p>Overview of assessment:</p> <ul style="list-style-type: none"> • The paper is assessed through a two-hour examination paper set and marked by Edexcel. • The total number of marks is 120. 	

Biology Paper 2	Paper code: 4BI0/2B
<ul style="list-style-type: none"> • Externally assessed • Availability: January and June series • First assessment: June 2011 	33% of the total IGCSE marks
<p>Overview of content:</p> <p>Assesses all content – including the content in bold</p> <ul style="list-style-type: none"> • Section 1: The nature and variety of living organisms • Section 2: Structures and functions in living organisms • Section 3: Reproduction and inheritance • Section 4: Ecology and the environment • Section 5: Use of biological resources 	
<p>Overview of assessment:</p> <ul style="list-style-type: none"> • The paper is assessed through a one-hour examination paper set and marked by Edexcel. • The total number of marks is 60. 	

Qualification content

Paper 1 will assess only content which is not in bold.

Paper 2 will assess all content including content in bold.

Section 1: The nature and variety of living organisms

a) Characteristics of living organisms

b) Variety of living organisms

a) Characteristics of living organisms

Students will be assessed on their ability to:

1.1 recall that living organisms share the following basic characteristics:

- they require nutrition
- they respire
- they excrete their waste
- they respond to their surroundings
- they move
- they control their internal conditions
- they reproduce
- they grow and develop.

b) Variety of living organisms

Students will be assessed on their ability to:

1.2 describe the common features shared by organisms within the following main groups, plants, animals, fungi, bacteria, protocists and viruses, and for each group describe examples and their features as follows (details of life cycle and economic importance are **not** required).

Plants: These are multicellular organisms; they contain chloroplasts and are able to carry out photosynthesis; they have cellulose cell walls; they store carbohydrates as starch or sucrose.

Examples include flowering plants, such as a cereal (for example maize) and a herbaceous legume (for example peas or beans).

Animals: These are multicellular organisms; they do not contain chloroplasts and are not able to carry out photosynthesis; they have no cell walls; they usually have nervous coordination and are able to move from one place to another; they often store carbohydrate as glycogen.

Examples include mammals (for example humans) and insects (for example housefly and mosquito).

Fungi: These are organisms that are not able to carry out photosynthesis; their body is usually organised into a mycelium made from thread-like structures called hyphae, which contain many nuclei; some examples are single-celled; they have cell walls made of chitin; they feed by extracellular secretion of digestive enzymes onto food material and absorption of the organic products; this is known as saprotrophic nutrition; they may store carbohydrate as glycogen.

Examples include *Mucor*, which has the typical fungal hyphal structure, and yeast which is single-celled.

Bacteria: These are microscopic single-celled organisms; they have a cell wall, cell membrane, cytoplasm and plasmids; they lack a nucleus but contain a circular chromosome of DNA; some bacteria can carry out photosynthesis but most feed off other living or dead organisms.

Examples include *Lactobacillus bulgaricus*, a rod-shaped bacterium used in the production of yoghurt from milk, and *Pneumococcus*, a spherical bacterium that acts as the pathogen causing pneumonia.

Protoctists: These are microscopic single-celled organisms. Some, like *Amoeba*, that live in pond water, have features like an animal cell, while others, like *Chlorella*, have chloroplasts and are more like plants. A pathogenic example is *Plasmodium*, responsible for causing malaria.

Viruses: These are small particles, smaller than bacteria; they are parasitic and can reproduce only inside living cells; they infect every type of living organism. They have a wide variety of shapes and sizes; they have no cellular structure but have a protein coat and contain one type of nucleic acid, either DNA or RNA.

Examples include the tobacco mosaic virus that causes discolouring of the leaves of tobacco plants by preventing the formation of chloroplasts, the influenza virus that causes 'flu' and the HIV virus that causes AIDS.

- 1.3 Recall the term 'pathogen' and know that pathogens may be fungi, bacteria, protoctists or viruses.

Section 2: Structures and functions in living organisms

- a) Levels of organisation
 - b) Cell structure
 - c) Biological molecules
 - d) Movement of substances into and out of cells
 - e) Nutrition
 - f) Respiration
 - g) Gas exchange
 - h) Transport
 - i) Excretion
 - j) Coordination and response
- a) **Levels of organisation**

Students will be assessed on their ability to:

- 2.1 describe the levels of organisation within organisms: organelles, cells, tissues, organs and systems.

b) **Cell structure**

Students will be assessed on their ability to:

- 2.2 recognise cell structures, including the nucleus, cytoplasm, cell membrane, cell wall, chloroplast and vacuole
- 2.3 describe the functions of the nucleus, cytoplasm, cell membrane, cell wall, chloroplast and vacuole
- 2.4 describe the differences between plant and animal cells.

c) Biological molecules

Students will be assessed on their ability to:

- 2.5 recall the chemical elements present in carbohydrates, proteins and lipids (fats and oils)
- 2.6 describe the structure of carbohydrates, proteins and lipids as large molecules made up from smaller basic units: starch and glycogen from simple sugar; protein from amino acids; lipid from fatty acids and glycerol
- 2.7 describe the tests for glucose and starch
- 2.8 understand the role of enzymes as biological catalysts in metabolic reactions
- 2.9 understand how the functioning of enzymes can be affected by changes in temperature
- 2.10 understand how the functioning of enzymes can be affected by changes in pH**
- 2.11 describe how to carry out simple controlled experiments to illustrate how enzyme activity can be affected by changes in temperature.

d) Movement of substances into and out of cells

Students will be assessed on their ability to:

- 2.12 recall simple definitions of diffusion, osmosis and active transport
- 2.13 understand that movement of substances into and out of cells can be by diffusion, osmosis and active transport
- 2.14 understand the importance in plants of turgid cells as a means of support**
- 2.15 understand the factors that affect the rate of movement of substances into and out of cells to include the effects of surface area to volume ratio, temperature and concentration gradient
- 2.16 describe simple experiments on diffusion and osmosis using living and non-living systems.

e) Nutrition

Students will be assessed on their ability to:

Flowering plants

- 2.17 describe the process of photosynthesis and understand its importance in the conversion of light energy to chemical energy
- 2.18 recall the word equation and the balanced chemical symbol equation for photosynthesis
- 2.19 understand how carbon dioxide concentration, light intensity and temperature affect the rate of photosynthesis
- 2.20 explain how the structure of the leaf is adapted for photosynthesis
- 2.21 recall that plants require mineral ions for growth and that magnesium ions are needed for chlorophyll and nitrate ions are needed for amino acids
- 2.22 describe simple controlled experiments to investigate photosynthesis, showing the evolution of oxygen from a water plant, the production of starch and the requirements of light, carbon dioxide and chlorophyll

Humans

- 2.23 understand that a balanced diet should include appropriate proportions of carbohydrate, protein, lipid, vitamins, minerals, water and dietary fibre**
- 2.24 recall sources and describe functions of carbohydrate, protein, lipid (fats and oils), vitamins A, C and D, and the mineral ions calcium and iron, water and dietary fibre as components of the diet
- 2.25 understand that energy requirements vary with activity levels, age and pregnancy**
- 2.26 recognise the structures of the human alimentary canal and describe in outline the functions of the mouth, oesophagus, stomach, small intestine, large intestine and pancreas
- 2.27 understand the processes of ingestion, digestion, absorption, assimilation and egestion
- 2.28 explain how and why food is moved through the gut by peristalsis
- 2.29 understand the role of digestive enzymes to include the digestion of starch to glucose by amylase and maltase, the digestion of proteins to amino acids by proteases and the digestion of lipids to fatty acids and glycerol by lipases
- 2.30 recall that bile is produced by the liver and stored in the gall bladder, and understand the role of bile in neutralising stomach acid and emulsifying lipids
- 2.31 explain how the structure of a villus helps absorption of the products of digestion in the small intestine
- 2.32 recall how to carry out a simple experiment to determine the energy content in a food sample.**

f) Respiration

Students will be assessed on their ability to:

- 2.33 recall that the process of respiration releases energy in living organisms
- 2.34 describe the differences between aerobic and anaerobic respiration
- 2.35 recall the word equation and the balanced chemical symbol equation for aerobic respiration in living organisms
- 2.36 recall the word equation for anaerobic respiration in plants and in animals
- 2.37 describe simple controlled experiments to demonstrate the evolution of carbon dioxide and heat from respiring seeds or other suitable living organisms.**

g) Gas exchange

Students will be assessed on their ability to:

- 2.38 understand the role of diffusion in gas exchange

Flowering plants

- 2.39 understand gas exchange (of carbon dioxide and oxygen) in relation to respiration and photosynthesis
- 2.40 understand that respiration continues during the day and night, but that the net exchange of carbon dioxide and oxygen depends on the intensity of light**
- 2.41 explain how the structure of the leaf is adapted for gas exchange
- 2.42 describe the role of stomata in gas exchange
- 2.43 describe simple controlled experiments to investigate the effect of light on net gas exchange from a leaf, using hydrogen-carbonate indicator**

Humans

- 2.44 describe the structure of the thorax, including the ribs, intercostal muscles, diaphragm, trachea, bronchi, bronchioles, alveoli and pleural membranes
- 2.45 understand the role of the intercostal muscles and the diaphragm in ventilation
- 2.46 explain how alveoli are adapted for gas exchange by diffusion between air in the lungs and blood in capillaries
- 2.47 understand the biological consequences of smoking in relation to the lungs and the circulatory system
- 2.48 describe a simple experiment to investigate the effect of exercise on breathing in humans.

h) Transport

Students will be assessed on their ability to:

- 2.49 understand why simple, unicellular organisms can rely on diffusion for movement of substances in and out of the cell
- 2.50 understand the need for a transport system in multicellular organisms

Flowering plants

- 2.51 describe the role of phloem in transporting sucrose and amino acids between the leaves and other parts of the plant**
- 2.52 describe the role of the xylem in transporting water and mineral salts from the roots to other parts of the plant
- 2.53 explain how water is absorbed by root hair cells
- 2.54 recall that transpiration is the evaporation of water from the surface of a plant
- 2.55 explain how the rate of transpiration is affected by changes in humidity, wind speed, temperature and light intensity
- 2.56 describe experiments that investigate the role of environmental factors in determining the rate of transpiration from a leafy shoot

Humans

- 2.57 recall the composition of the blood: red blood cells, white blood cells, platelets and plasma
- 2.58 understand the role of plasma in the transport of carbon dioxide, digested food, urea, hormones and heat energy
- 2.59 describe the adaptations of red blood cells for the transport of oxygen, including shape, structure and the presence of haemoglobin
- 2.60 describe how the immune system responds to disease using white blood cells, illustrated by phagocytes ingesting pathogens and lymphocytes releasing antibodies specific to the pathogen
- 2.61 understand that vaccination results in the manufacture of memory cells, which enable future antibody production to the pathogen to occur sooner, faster and in greater quantity**
- 2.62 recall that platelets are involved in blood clotting, which prevents blood loss and the entry of microorganisms**
- 2.63 describe the structure of the heart and how it functions
- 2.64 understand that the heart rate changes during exercise and under the influence of adrenaline
- 2.65 describe the structure of arteries, veins and capillaries and understand their roles
- 2.66 recall the general plan of the circulation system to include the blood vessels to and from the heart, the lungs, the liver and the kidneys.

i) Excretion

Students will be assessed on their ability to:

Flowering plants

- 2.67 recall the origin of carbon dioxide and oxygen as waste products of metabolism and their loss from the stomata of a leaf

Humans

- 2.68 recall that the lungs, kidneys and skin are organs of excretion
- 2.69 understand how the kidney carries out its roles of excretion and of osmoregulation
- 2.70 describe the structure of the urinary system, including the kidneys, ureters, bladder and urethra
- 2.71 describe the structure of a nephron, to include Bowman's capsule and glomerulus, convoluted tubules, loop of Henlé and collecting duct
- 2.72 describe ultrafiltration in the Bowman's capsule and the composition of the glomerular filtrate
- 2.73 understand that water is reabsorbed into the blood from the collecting duct
- 2.74 understand that selective reabsorption of glucose occurs at the proximal convoluted tubule
- 2.75 describe the role of ADH in regulating the water content of the blood
- 2.76 recall that urine contains water, urea and salts.

j) Coordination and response

Students will be assessed on their ability to:

- 2.77 understand that organisms are able to respond to changes in their environment
- 2.78 understand that homeostasis is the maintenance of a constant internal environment and that body water content and body temperature are both examples of homeostasis
- 2.79 understand that a coordinated response requires a stimulus, a receptor and an effector

Flowering plants

- 2.80 understand that plants respond to stimuli
- 2.81 describe the geotropic responses of roots and stems
- 2.82 describe positive phototropism of stems

Humans

- 2.83 describe how responses can be controlled by nervous or by hormonal communication and understand the differences between the two systems
- 2.84 recall that the central nervous system consists of the brain and spinal cord and is linked to sense organs by nerves
- 2.85 understand that stimulation of receptors in the sense organs sends electrical impulses along nerves into and out of the central nervous system, resulting in rapid responses
- 2.86 describe the structure and functioning of a simple reflex arc illustrated by the withdrawal of a finger from a hot object
- 2.87 describe the structure and function of the eye as a receptor
- 2.88 understand the function of the eye in focusing near and distant objects, and in responding to changes in light intensity**
- 2.89 describe the role of the skin in temperature regulation, with reference to sweating, vasoconstriction and vasodilation**
- 2.90 understand the sources, roles and effects of the following hormones: ADH, adrenaline, insulin, testosterone, progesterone and oestrogen.

Section 3: Reproduction and inheritance

- a) Reproduction
- b) Inheritance

- a) Reproduction

Students will be assessed on their ability to:

- 3.1 describe the differences between sexual and asexual reproduction
- 3.2 understand that fertilisation involves the fusion of a male and female gamete to produce a zygote that undergoes cell division and develops into an embryo

Flowering plants

- 3.3 describe the structures of an insect-pollinated and a wind-pollinated flower and explain how each is adapted for pollination
- 3.4 understand that the growth of the pollen tube followed by fertilisation leads to seed and fruit formation
- 3.5 recall the conditions needed for seed germination**
- 3.6 understand how germinating seeds utilise food reserves until the seedling can carry out photosynthesis**
- 3.7 understand that plants can reproduce asexually by natural methods (illustrated by runners) and by artificial methods (illustrated by cuttings)

Humans

- 3.8 recall the structure and function of the male and female reproductive systems
- 3.9 understand the roles of oestrogen and progesterone in the menstrual cycle
- 3.10 describe the role of the placenta in the nutrition of the developing embryo**
- 3.11 understand how the developing embryo is protected by amniotic fluid**
- 3.12 recall the roles of oestrogen and testosterone in the development of secondary sexual characteristics.

b) Inheritance

- 3.13 recall that the nucleus of a cell contains chromosomes on which genes are located
- 3.14 understand that a gene is a section of a molecule of DNA
- 3.15 describe a DNA molecule as two strands coiled to form a double helix, the strands being linked by a series of paired bases: adenine (A) with thymine (T), and cytosine (C) with guanine (G)
- 3.16 understand that genes exist in alternative forms called alleles which give rise to differences in inherited characteristics
- 3.17 recall the meaning of the terms: dominant, recessive, homozygous, heterozygous, phenotype, genotype and **codominance**
- 3.18 describe patterns of monohybrid inheritance using a genetic diagram
- 3.19 understand how to interpret family pedigrees
- 3.20 predict probabilities of outcomes from monohybrid crosses
- 3.21 recall that the sex of a person is controlled by one pair of chromosomes, XX in a female and XY in a male
- 3.22 describe the determination of the sex of offspring at fertilisation, using a genetic diagram
- 3.23 understand that division of a diploid cell by mitosis produces two cells which contain identical sets of chromosomes
- 3.24 understand that mitosis occurs during growth, repair, cloning and asexual reproduction
- 3.25 understand that division of a cell by meiosis produces four cells, each with half the number of chromosomes, and that this results in the formation of genetically different haploid gametes
- 3.26 understand that random fertilisation produces genetic variation of offspring
- 3.27 recall that in human cells the diploid number of chromosomes is 46 and the haploid number is 23
- 3.28 understand that variation within a species can be genetic, environmental, or a combination of both
- 3.29 recall that mutation is a rare, random change in genetic material that can be inherited
- 3.30 describe the process of evolution by means of natural selection
- 3.31 understand that many mutations are harmful but some are neutral and a few are beneficial
- 3.32 understand how resistance to antibiotics can increase in bacterial populations
- 3.33 understand that the incidence of mutations can be increased by exposure to ionising radiation (for example gamma rays, X-rays and ultraviolet rays) and some chemical mutagens (for example chemicals in tobacco).**

Section 4: Ecology and the environment

- a) The organism in the environment
- b) Feeding relationships
- c) Cycles within ecosystems
- d) Human influences on the environment

a) The organism in the environment

Students will be assessed on their ability to:

- 4.1 understand the terms population, community, habitat and ecosystem
- 4.2 recall the use of quadrats to estimate the population size of an organism in two different areas
- 4.3 describe the use of quadrats as a technique for sampling the distribution of organisms in their habitats.

b) Feeding relationships

Students will be assessed on their ability to:

- 4.4 recall the names given to different trophic levels to include producers, primary, secondary and tertiary consumers and decomposers
- 4.5 understand the concepts of food chains, food webs, pyramids of number, pyramids of biomass and pyramids of energy transfer
- 4.6 understand the transfer of substances and of energy along a food chain
- 4.7 explain why only about 10% of energy is transferred from one trophic level to the next.

c) Cycles within ecosystems

Students will be assessed on their ability to:

- 4.8 describe the stages in the water cycle, including evaporation, transpiration, condensation and precipitation**
- 4.9 describe the stages in the carbon cycle, including respiration, photosynthesis, decomposition and combustion
- 4.10 describe the stages in the nitrogen cycle, including the roles of nitrogen fixing bacteria, decomposers, nitrifying bacteria and denitrifying bacteria (specific names of bacteria are not required).**

d) Human influences on the environment

Students will be assessed on their ability to:

- 4.11 understand the biological consequences of pollution of air by sulfur dioxide and by carbon monoxide
- 4.12 recall that water vapour, carbon dioxide, nitrous oxide, methane and CFCs are greenhouse gases
- 4.13 understand how human activities contribute to greenhouse gases
- 4.14 understand how an increase in greenhouse gases results in an enhanced greenhouse effect and that this may lead to global warming and its consequences
- 4.15 understand the biological consequences of pollution of water by sewage including increases in the number of microorganisms causing depletion of oxygen**
- 4.16 understand that eutrophication can result from leached minerals from fertiliser
- 4.17 understand the effects of deforestation, including leaching, soil erosion, disturbance of the water cycle and of the balance in atmospheric oxygen and carbon dioxide.

Section 5: Use of biological resources

- a) Food production
- b) Selective breeding
- c) Genetic modification
- d) Cloning

a) Food production

Students will be assessed on their ability to:

Crop plants

- 5.1 describe how glasshouses and polythene tunnels can be used to increase the yield of certain crops
- 5.2 understand the effects on crop yield of increased carbon dioxide and increased temperature in glasshouses
- 5.3 understand the use of fertiliser to increase crop yield
- 5.4 understand the reasons for pest control and the advantages and disadvantages of using pesticides and biological control with crop plants

Microorganisms

- 5.5 understand the role of yeast in the production of beer
- 5.6 describe a simple experiment to investigate carbon dioxide production by yeast, in different conditions
- 5.7 understand the role of bacteria (*Lactobacillus*) in the production of yoghurt**
- 5.8 interpret and label a diagram of an industrial fermenter and explain the need to provide suitable conditions in the fermenter, including aseptic precautions, nutrients, optimum temperature and pH, oxygenation and agitation, for the growth of microorganisms

Fish farming

- 5.9 explain the methods which are used to farm large numbers of fish to provide a source of protein, including maintenance of water quality, control of intraspecific and interspecific predation, control of disease, removal of waste products, quality and frequency of feeding and the use of selective breeding.

b) Selective breeding

Students will be assessed on their ability to:

- 5.10 understand that plants with desired characteristics can be developed by selective breeding
- 5.11 understand that animals with desired characteristics can be developed by selective breeding.

c) Genetic modification (genetic engineering)

Students will be assessed on their ability to:

- 5.12 describe the use of restriction enzymes to cut DNA at specific sites and ligase enzymes to join pieces of DNA together
- 5.13 describe how plasmids and viruses can act as vectors, which take up pieces of DNA, then insert this recombinant DNA into other cells
- 5.14 understand that large amounts of human insulin can be manufactured from genetically modified bacteria that are grown in a fermenter
- 5.15 evaluate the potential for using genetically modified plants to improve food production (illustrated by plants with improved resistance to pests)
- 5.16 recall that the term ‘transgenic’ means the transfer of genetic material from one species to a different species.**

d) Cloning

Students will be assessed on their ability to:

- 5.17 describe the process of micropropagation (tissue culture) in which small pieces of plants (explants) are grown *in vitro* using nutrient media
- 5.18 understand how micropropagation can be used to produce commercial quantities of identical plants (clones) with desirable characteristics
- 5.19 describe the stages in the production of cloned mammals involving the introduction of a diploid nucleus from a mature cell into an enucleated egg cell, illustrated by Dolly the sheep
- 5.20 evaluate the potential for using cloned transgenic animals, for example to produce commercial quantities of human antibodies or organs for transplantation.**

Assessment

Assessment summary

Biology Paper 1

This paper will assess biology across all the Assessment Objectives. All the content in this specification which is not in bold will be assessed in Paper 1. The maximum mark for this paper is 120.

Biology Paper 2

This paper will assess biology across all the Assessment Objectives. All the content in this specification, whether bold or not, will be assessed in Paper 2. The maximum mark for this paper is 60.

There will be a range of compulsory, short-answer structured questions in both papers which are ramped to ensure accessibility for less-able students, as well as to stretch more-able students.

Students may be required to perform calculations, draw graphs and describe, explain and interpret biological phenomena. Some of the question content will be unfamiliar to students; these questions are designed to assess data-handling skills and the ability to apply biological principles to unfamiliar information. Questions targeted at grades A* – B will include questions designed to test knowledge, understanding and skills at a higher level, including some questions requiring longer prose answers.

Summary of table of assessment

Biology Paper 1	Paper code: 4BI0/1B
<ul style="list-style-type: none">• Externally assessed• Availability: January and June series• First assessment: June 2011	
Biology Paper 2	Paper code: 4BI0/2B
<ul style="list-style-type: none">• Externally assessed• Availability: January and June series• First assessment: June 2011	

Assessment Objectives and weightings

A01 Knowledge and understanding

In the examination, students will be tested on their ability to:

- recognise, recall and show understanding of specific biological facts, terminology, principles, concepts and practical techniques including aspects of safety
- draw on existing knowledge to show understanding of the ethical, social, environmental, economic and technological applications and implications of biology
- select, organise and present relevant information clearly and logically, using appropriate vocabulary.

A02 Application of knowledge and understanding, analysis and evaluation

In the examination, students will be tested on their ability to:

- describe, explain and interpret phenomena, effects and ideas in terms of biological principles and concepts, presenting arguments and ideas clearly and logically
- interpret and translate data presented as continuous prose or in tables, diagrams, drawings and graphs, from one form to another
- carry out relevant calculations
- apply biological principles and concepts in solving problems in unfamiliar situations, including those related to the ethical, social, economic and technological applications and implications of biology
- assess the validity of biological information, experiments, inferences and statements and make informed judgements from them.

A03 Investigative skills

In the assessment of these practical skills, students will be tested on their ability to:

- devise and plan investigations, drawing on biological knowledge and understanding in selecting appropriate techniques
- demonstrate or describe appropriate experimental and investigative methods, including safe and skilful practical techniques
- make observations and measurements with appropriate precision, record these methodically, and present them in a suitable form
- analyse and interpret data to draw conclusions from experimental activities which are consistent with the evidence, using biological knowledge and understanding, and to communicate these findings using appropriate specialist vocabulary, relevant calculations and graphs
- evaluate data and methods.

	% in IGCSE
AO1: Knowledge and understanding	45–55%
AO2: Application of knowledge and understanding, analysis and evaluation	25–35%
AO3: Investigative skills	20%
TOTAL	100%

Relationship of Assessment Objectives to Papers for IGCSE

Paper number	Assessment Objective			Total for AO1, AO2 and AO3
	AO1	AO2	AO3	
Paper 1	30–36%	17–23%	13 $\frac{1}{3}$ %	66 $\frac{2}{3}$ %
Paper 2	15–19%	8–12%	6 $\frac{2}{3}$ %	33 $\frac{1}{3}$ %
Total for IGCSE	45–55%	25–35%	20%	100%

Entering your students for assessment

Student entry

Details of how to enter students for this qualification can be found in Edexcel's *International Information Manual*, copies of which (in CD format) are sent to all active Edexcel centres. The information can also be found on Edexcel's website.

Combinations of entry

Students entering for this specification may not, in the same series of examinations, enter for the Edexcel IGCSE in Science (Double Award (4SC0), (first examination June 2011).

Access arrangements and special requirements

Edexcel's policy on access arrangements and special considerations for GCE, GCSE, IGCSE, and Entry Level qualifications aims to enhance access to the qualifications for students with disabilities and other difficulties without compromising the assessment of skills, knowledge, understanding or competence.

Please see the Edexcel website (www.edexcel.com) for:

- the Joint Council for Qualifications (JCQ) policy *Access Arrangements and Special Considerations, Regulations and Guidance Relating to Students who are Eligible for Adjustments in Examinations*
- the forms to submit for requests for access arrangements and special considerations
- dates for submission of the forms.

Requests for access arrangements and special considerations must be addressed to:

Special Requirements
Edexcel
One90 High Holborn
London WC1V 7BH

Health and safety

Students must follow the health and safety rules which normally operate in their laboratories. This will include the following:

- eye protection must always be worn
- laboratory coats must always be worn
- plastic gloves must be worn when supplied for a particular exercise
- all substances should be regarded as being potentially toxic and hazardous
- HazChem labels (for example flammable) should be read and appropriate precautions (for example keep liquid away from flame) taken
- all substances spilled on the skin should be rinsed off immediately
- chemicals must never be tasted
- gases and vapours should never be smelt unless the question instructs the candidates to do so and then only with great care.

With all laboratory practicals it is essential that centres carry out a detailed risk assessment before allowing students to carry out the practical. For further information on risk assessments and chemical hazards please refer to the CLEAPSS website (www.cleapss.org.uk).

Assessing your students

The first assessment opportunity for Papers 1 and 2 of this qualification will take place in the June 2011 series and in each following January and June series for the lifetime of the specification.

Your student assessment opportunities

Paper	June 2011	Jan 2012	June 2012	Jan 2013
Biology Paper 1	✓	✓	✓	✓
Biology Paper 2	✓	✓	✓	✓

Awarding and reporting

The grading, awarding and certification of this qualification will follow the processes outlined in the current GCSE/GCE Code of Practice for courses starting in September 2009, which is published by the Qualifications and Curriculum Authority (QCA). The IGCSE qualification will be graded and certificated on an eight-grade scale from A* to G.

Students whose level of achievement is below the minimum standard for Grade G will receive an unclassified U. Where unclassified is received it will not be recorded on the certificate.

The first certification opportunity for the Edexcel IGCSE in Biology will be June 2011.

Language of assessment

Assessment of this specification will be available in English only. Assessment materials will be published in English only and all work submitted for examination and moderation must be produced in English.

Malpractice and plagiarism

For up-to-date advice on malpractice and plagiarism, please refer to the JCQ's *Suspected Malpractice in Examinations: Policies and Procedures* document on the JCQ website www.jcq.org.uk.

Student recruitment

Edexcel's access policy concerning recruitment to our qualifications is that:

- they must be available to anyone who is capable of reaching the required standard
- they must be free from barriers that restrict access and progression
- equal opportunities exist for all students.

Progression

This qualification supports progression to:

- Edexcel GCE Advanced Subsidiary and Advanced Level Biology
- Edexcel Level 3 BTEC National Award/Certificate/Diploma in Applied Science.

Grade descriptions

Grade A

Candidates can:

- recall a wide range of knowledge from all areas of the specification
- use detailed scientific knowledge and understanding in a range of applications relating to scientific systems or phenomena: for example, they explain how temperature or water content is regulated in humans
- draw together and communicate knowledge from more than one area, use routinely scientific or mathematical conventions in support of arguments and use a wide range of scientific and technical vocabulary throughout their work
- use scientific knowledge and understanding to select an appropriate strategy for a practical task, identifying the key factors to be considered. They make systematic observations and decide which observations are relevant to the task in hand. When making measurements they decide the level of precision needed and can recall or use a range of apparatus to make appropriately precise measurements. They select a method of presenting data appropriate to the task; they use information from a range of sources where it is appropriate to do so. They identify and explain anomalous observations and measurements and the salient features of graphs
- use scientific knowledge and understanding to identify and explain patterns and draw conclusions from the evidence by combining data of more than one kind or from more than one source. They identify shortcomings in evidence, use scientific knowledge and understanding to draw conclusions from their evidence and suggest improvements to methods used that would enable them to collect more reliable evidence.

Grade C

Candidates can:

- recall a range of scientific information from all areas of the specification: for example, they explain how the lungs are ventilated
- use and apply biological knowledge and understanding in some general contexts: for example, they describe how a leaf is adapted to its functions
- describe links between related phenomena in different contexts: use diagrams, charts and graphs to support arguments, use appropriate scientific and technical vocabulary in a range of contexts
- use scientific knowledge and understanding to identify an approach to a question: for example, identifying key factors to vary and control. Students can recall or use a range of apparatus to make careful and precise measurements and systematic observations and recognise when it is necessary to repeat measurements and observations. They present data systematically, for example in graphs, and use lines of best fit. Students identify and explain patterns within data and draw conclusions consistent with the evidence. They explain these conclusions using scientific knowledge and understanding and evaluate how strongly their evidence supports the conclusions.

Grade F

Candidates can:

- recall a limited range of information: for example, they state the main functions of organs of the human body, they know that plants need light for photosynthesis
- use and apply knowledge and understanding in some specific everyday contexts: for example, they describe how the heart rate increases with exercise
- make some use of scientific and technical vocabulary and make simple generalisations from information
- devise fair tests in contexts which involve only a few factors. They can recall or use simple apparatus to make measurements appropriate to the task and record observations and measurements in tables and graphs. Students obtain information from simple tables, charts and graphs and identify simple patterns. They offer explanations consistent with the evidence obtained.

Support and training

Edexcel support services

Edexcel has a wide range of support services to help you implement this qualification successfully.

ResultsPlus – ResultsPlus is an application launched by Edexcel to help subject teachers, senior management teams, and students by providing detailed analysis of examination performance. Reports that compare performance between subjects, classes, your centre and similar centres can be generated in ‘one-click’. Skills maps that show performance according to the specification topic being tested are available for some subjects. For further information about which subjects will be analysed through ResultsPlus, and for information on how to access and use the service, please visit www.edexcel.com/resultsplus.

Ask the Expert – Ask the Expert is a new service, launched in 2007, that provides direct email access to senior subject specialists who will be able to answer any questions you might have about this or any other specification. All of our specialists are senior examiners, moderators or verifiers and they will answer your email personally. You can read a biography for all of them and learn more about this unique service on our website at www.edexcel.com/asktheexpert.

Ask Edexcel – Ask Edexcel is Edexcel’s online question and answer service. You can access it at www.edexcel.com/ask or by going to the main website and selecting the Ask Edexcel menu item on the left.

The service allows you to search through a database of thousands of questions and answers on everything Edexcel offers. If you don’t find an answer to your question, you can choose to submit it straight to us. One of our customer services team will log your query, find an answer and send it to you. They’ll also consider adding it to the database if appropriate. This way the volume of helpful information that can be accessed via the service is growing all the time.

Examzone – The Examzone site is aimed at students sitting external examinations and gives information on revision, advice from examiners and guidance on results, including re-marking, re-sitting and progression opportunities. Further services for students – many of which will also be of interest to parents – will be available in the near future. Links to this site can be found on the main homepage at www.examzone.co.uk.

Training

A programme of professional development and training courses, covering various aspects of the specification and examination, will be arranged by Edexcel. Full details can be obtained from our website: www.edexcel.com.

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For more information on Edexcel and BTEC qualifications
please visit our website: www.edexcel.com

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