

Switching to AQA from OCR A and Additional Science (Biology components)

If you are thinking of switching to AQA from OCR Science A and Additional Science for teaching from September 2016, this resource will provide a helpful comparison of the subject content and assessment for each awarding body.

It directly compares the Biology components of the current OCR 21st Century Science A and Additional Science A (J241 and J242) with the Biology component of the new AQA GCSE Combined Science: Trilogy specification (8464).

The subject content and required practicals for the GCSE Combined Science: Trilogy are also in the GCSE Biology specification, so there is the flexibility to co-teach or to move students between courses.

Comparison overview

The two specifications are quite different in terms of content and organisation.

OCR

This specification contains more detail on the brain, conditioned reflexes, cloning, DNA structure and protein synthesis, the nitrogen cycle and indicator species.

AQA

The AQA specification contains more detail on digestion, heart treatments, leaf structure, diabetes, fertility, genetic engineering, classification systems, predator-prey cycles and deforestation.

The content can be delivered in a variety of ways. Suggestions for learning activities are given in the scheme of work. These provide many opportunities to develop practical, working scientifically and mathematical skills.

Assessment

New AQA specification	Current OCR specifications
<p>Two externally assessed written papers (1 hour 15 minutes).</p> <ul style="list-style-type: none"> Paper 1 examines Topics 1-4: Cell Biology, Organisation, Infection and 	<p>Two externally assessed biology written papers (1 hour).</p> <p>The content is organised into six modules.</p> <ul style="list-style-type: none"> Modules B1 to B3: You and

New AQA specification	Current OCR specifications
<p>response, Bioenergetics.</p> <ul style="list-style-type: none"> • Paper 2 examines Topics 5-7: Homeostasis and response, Inheritance, variation and evolution, Ecology. <p>Five required practicals should be carried out by students and may be examined in the written papers to assess practical skills.</p>	<p>your genes, Keeping healthy, Life on Earth are assessed in Science A.</p> <ul style="list-style-type: none"> • Modules B4 to B6: The processes of life, Growth and development, Brain and mind are assessed in Additional Science A. <p>Controlled assessments internally assess practical skills.</p>
<p>The required practicals are clearly listed, as are opportunities for development of skills identified in the right-hand column of the specification. These should encourage more practical work, which will motivate students and encourage the transfer of skills across the subject.</p>	<p>Opportunities for practical work are included at the beginning of each of the six modules.</p>

Content

Working scientifically

New AQA specification	Current OCR specifications
<p>Specification reference: WS 1.1 to WS 4.6</p>	<p>Specification reference: Ideas about science</p>
<p>'Working scientifically' encompasses all the activities that scientists do. It is woven throughout the specification and written papers. There are cross-references to relevant activities in the content.</p>	<p>The specification has interpreted the principles of 'How science works' into a series of 'Ideas about Science'. Each module overview identifies relevant issues. Including opportunities for practical work, mathematics and ICT.</p>

Cell biology

4.1.1 Cell structure

New AQA specification	Current OCR specifications
Specification reference: 4.1.1.1 to 4.1.1.5	Specification reference: <ul style="list-style-type: none">• Plant cells: B4.2• Animal, bacterial and yeast cells: B4.3• Specialised cells: B1.4 and B5.1
Both specifications contain similar content relating to plant, animal and bacterial cell structure. Cell specialisation is also covered.	
More detail is given in relation to cell differentiation.	The functions of cell structures are related to respiration and photosynthesis in plant cells. Ribosomes are not mentioned.
A comparison of light and electron microscopes. Calculations involving magnification, real size and image size.	Using a microscope to observe cells and leaf structure is mentioned, but there is no other reference to microscopy.
Comparison of eukaryotic and prokaryotic cells.	Eukaryotic and prokaryotic cells are not mentioned.

4.1.2 Cell division

New AQA specification	Current OCR specifications
Specification reference: 4.1.2.1 to 4.1.2.3	Specification reference: <ul style="list-style-type: none">• Chromosomes: B1.1• Stem cells: B1.4, B5.1, B5.3• Mitosis and the cell cycle: B5.2
Chromosome structure, mitosis, the cell cycle and stem cells are covered in a similar way in both specifications. The risks, benefits and ethical issues have to be considered in relation to the use of stem cells.	

New AQA specification	Current OCR specifications
Stem cells may be used to help conditions such as diabetes and paralysis.	Up to the eight cell stage in a human embryo the cells are unspecialised stem cells.

4.1.3 Transport in cells

New AQA specification	Current OCR specifications
Specification reference: 4.1.3.1 to 4.1.3.3	Specification reference <ul style="list-style-type: none"> • Diffusion and osmosis B4.2 • Active transport B4.2 and B4.3
Both specifications cover diffusion, osmosis and active transport.	
Factors affecting the rate of diffusion. The need for specialised exchange surfaces in multicellular organisms. Factors affecting the effectiveness of exchange surfaces.	N/A
There is a required practical to investigate the effect of salt or sugar solutions on plant tissue.	A similar investigation using potato cells is included. There is also an investigation of the rate of diffusion in different media.
Active transport is linked to mineral ion absorption, kidney function and absorption of sugar from the gut.	Specification includes active transport and nitrate uptake in roots.

Organisation

4.2.1 Principles of organisation

New AQA specification	Current OCR specifications
Specification reference: 4.2.1.1	Specification reference: Organisation B5.1
Organisation is present in both specifications, but the new AQA specification includes definitions of cells, tissues and organs.	

4.2.2 Animal tissues, organs and organ systems

New AQA specification	Current OCR specifications
<p>Specification reference: 4.2.2.1 to 4.2.2.7</p>	<p>Specification reference:</p> <ul style="list-style-type: none"> • Enzymes: B4.1 • Heart disease: B2.3 • Lifestyle: 2.3 • White blood cells: B2.1
<p>This section of the AQA specification covers digestive system and enzyme activity, the heart and circulatory system, non-communicable diseases such as CHD, Type 2 diabetes, cancer and some lung and liver diseases and their associated risk factors.</p> <p>Both specifications cover properties of enzymes and an understanding of the 'lock and key theory', including the investigation of enzyme activity.</p> <p>Both specifications cover the structure of blood vessels related to their function and the role of white blood cells in defence against disease. They include risk factors for heart disease and the effect of lifestyle on health.</p>	
<p>AQA specification assumes knowledge of the digestive system from KS3 and describes the action of digestive enzymes, including the role of bile.</p> <p>There is a required practical to investigate the effect of a factor on the rate of an enzyme-controlled reaction.</p>	<p>The digestive system and digestion are not covered.</p> <p>OCR specification suggests an investigation into the effects of an enzyme on biological processes.</p>
<p>The structure and functions of the heart and the blood.</p> <p>The relationship between the heart and lungs, the role of coronary arteries.</p> <p>There is much more focus on heart disease and treatments including pacemakers, stents, valves, artificial hearts, transplants and drugs.</p>	<p>Only white blood cells are referred to.</p> <p>Blood pressure is covered in detail. The effect of drug misuse on the heart and blood pressure.</p> <p>The use of epidemiological and large scale genetic studies to identify risk factors.</p>
<p>Factors affecting mental health. There is a section about cancers and how they spread in the body.</p>	<p>N/A</p>

4.2.3 Plant tissues, organs and systems

New AQA specification	Current OCR specifications
Specification reference: 4.2.3.1 to 4.2.3.2	Specification reference: Xylem, phloem and meristems B5.1
Xylem and phloem as specialised tissues. The role of meristems.	
Leaf structure, including the names and functions of tissues, is covered in detail.	The only reference to plant tissues and organs is in the suggested practical to use a microscope to look at the structure of leaves in B4.
Structure of xylem and phloem is covered in detail. The term translocation.	Xylem and phloem are only referred to as examples of specialised tissues. OCR specification doesn't refer to root hair cells.
Factors affecting the rate of transpiration and the role of stomata and guard cells to control gas exchange and water loss. There are several investigations and activities to develop skills in relation to transpiration.	N/A

Infection and response

4.3.1 Communicable diseases

New AQA specification	Current OCR specifications
Specification reference: 4.3.1.1 to 4.3.1.9 and 4.6.3.4	Specification reference: <ul style="list-style-type: none"> • Infection and immunity: B2.1 • Vaccinations and antibiotics: B2.2 • Drug testing: B2.2

New AQA specification	Current OCR specifications
<p>Viruses, bacteria and fungi can cause infectious diseases.</p> <p>Both specifications cover:</p> <ul style="list-style-type: none"> • Immunity and vaccinations. • The use of antibiotics and the development of antibiotic resistant organisms. • The testing of new drugs, including double-blind trials and placebos. 	
<p>A definition of pathogen and the causes, transmission, symptoms and prevention or treatment of several viral, bacterial, fungal and protist diseases of humans and plants. These include:</p> <ul style="list-style-type: none"> • measles • HIV • tobacco mosaic virus • salmonella • gonorrhoea • rose black spot • malaria. <p>Methods to reduce the spread of diseases.</p>	<p>Specific diseases or protists are not included.</p> <p>The cause of symptoms.</p> <p>OCR specification considers conditions affecting the population growth of microorganisms.</p>
<p>How the body defends itself against the entry of pathogens.</p> <p>The role of white blood cells in defence against pathogens is covered in more detail. It includes antitoxins and phagocytosis.</p>	<p>N/A</p>

New AQA specification	Current OCR specifications
<p>Vaccinations, antibiotics and painkillers.</p> <p>Antibiotic resistance is covered in detail in section 4.6.3.7. It includes how resistant strains evolve and how to reduce the rate at which they develop.</p>	Vaccinations and antibacterials, including antibiotics.
The discovery of drugs from plants and microorganisms as well as the synthesis of new drugs.	The risks associated with drugs.
The work of Fleming.	N/A

Bioenergetics

4.4.1 Photosynthesis

New AQA specification	Current OCR specifications
Specification reference: 4.4.1.1 to 4.4.1.3	Specification reference: <ul style="list-style-type: none"> • Photosynthesis: B4.2 • Phytoplankton: B4.1
<p>Both specifications cover the word and symbol equations for photosynthesis, factors affecting and limiting the rate of photosynthesis, and the interpretation of related data.</p> <p>There is a required practical in the AQA specification about the effect of a factor on the rate of photosynthesis. A similar investigation is suggested in OCR specification.</p> <p>The use of glucose produced by photosynthesis.</p>	
Photosynthesis is an endothermic reaction.	N/A
<p>Factors affecting the rate of photosynthesis also include the amount of chlorophyll.</p> <p>Use of the inverse square law in relation to light intensity.</p> <p>The economics of enhancing</p>	<p>How limiting factors affect the rate of photosynthesis only refers to temperature, carbon dioxide concentration and light intensity.</p> <p>Photosynthesis builds large food</p>

conditions in a greenhouse, while maintaining a profit.	molecules in plant cells and some microorganisms (phytoplankton).
N/A	Within the module, fieldwork techniques to investigate the effect of light on plants include the use of a light meter, a quadrat, an identification key and a transect.

4.4.2 Respiration

New AQA specification	Current OCR specifications
Specification reference: 4.4.2.1 to 4.4.2.3	Specification reference <ul style="list-style-type: none"> • Energy use: B4.1 and B4.3 • Aerobic and anaerobic respiration: B4.3 • Exercise: B4.3
<p>The use of energy in organisms.</p> <p>Comparison of aerobic and anaerobic respiration. Specification covers word and symbol equations for aerobic respiration, and the word equations for anaerobic respiration in animals, plants and yeast.</p> <p>Investigating the effect of exercise on the body.</p> <p>The importance of fermentation is covered in relation to bread and alcohol production.</p>	
<p>Respiration is an exothermic reaction.</p> <p>Word and symbol equations for anaerobic respiration in yeast and plants.</p>	N/A
<p>The section on exercise also includes reference to lactic acid build up and breakdown of lactic acid in the liver, oxygen debt and muscle fatigue.</p>	<p>Anaerobic respiration in plants in waterlogged soil and bacteria in puncture wounds.</p> <p>The effect of exercise on blood pressure and recovery rate.</p>
<p>There is a summary section on metabolism. Aspects of metabolism are covered in more detail in topic 4.2.2.1, 4.4.1.3, 4.4.2.1, 4.5.3.3.</p>	N/A

Biogas generators are not covered.	Biogas as a useful product of anaerobic respiration.
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Homeostasis and response

4.5.1 Homeostasis

New AQA specification	Current OCR specifications
Specification reference: 4.5.1.1	Specification reference: Homeostasis and control systems: B2.4
Both specifications define the term homeostasis and refer to osmoregulation which is covered in detail in later sections. There is description of automatic control systems in terms of receptors, coordination centres and effectors. Nervous and chemical examples.	

4.5.2 - The human nervous system

New AQA specification	Current OCR specifications
Specification reference: 4.5.2.1	Specification reference: <ul style="list-style-type: none"> • Detection of stimuli and responses: B6.1 • Nervous system, reflexes, drugs and the brain: B6.2 • Conditioned reflexes: B6.3 • Learning, memory and behaviour: B6.4
Both specifications cover the structure and functions of the nervous system, including reflex arc, and include investigations into reaction time.	
There is a required practical to investigate the effect of a factor on human reaction time.	Examples of simple reflexes, including newborn reflexes. There is more detail about the structure of neurones, including the terms axon and fatty sheath.
No detail about the brain.	The functions of the cerebral cortex. Techniques used by neuroscientists to map regions of the brain.

N/A	The effects of some toxins and drugs, including Ecstasy, beta blockers and Prozac on the transmission of impulses across synapses.
N/A	Conditioned reflexes are covered in detail.
N/A	There is a large section on how humans develop complex behaviour including the process of learning, memory and how to improve it and the use and limitations of models used to describe memory.

4.5.3 Hormonal coordination in humans

New AQA specification	Current OCR specifications
Specification reference: 4.5.3.1 to 4.5.3.6	Specification reference: <ul style="list-style-type: none"> • Hormones: B6.1 • Kidney function and ADH: B2.4 • Plant hormones: B5.1
Both specifications define hormone.	
Knowledge of the position of endocrine organs.	N/A
Control of blood glucose levels, Type 1 and Type 2 diabetes including their causes, treatments and risk factors.	N/A
N/A	Kidney function in relation to excretion of wastes and osmoregulation, the negative feedback mechanism of ADH. The effect of alcohol and Ecstasy on ADH secretion and urine production.

New AQA specification	Current OCR specifications
<p>The development of secondary sexual characteristics and hormonal control of the menstrual cycle.</p> <p>Hormonal and non-hormonal methods of contraception and the use of hormones in IVF treatment. Content includes negative aspects of fertility treatment.</p>	No content related to fertility.
The roles of adrenaline and thyroxin as negative feedback systems.	N/A
Plant hormones are not covered.	The OCR specification covers plant hormones, phototropism and the uses of plant hormones.

Inheritance, variation and evolution

4.6.1 Reproduction

New AQA specification	Current OCR specifications
Specification reference: 4.6.1.1 to 4.6.1.6	<p>Specification reference:</p> <ul style="list-style-type: none"> • Mitosis, meiosis and fertilisation: B5.1 and B5.2 • Asexual reproduction: B1.4 • DNA and protein synthesis: B1.1 and B 5.3 • Genetic inheritance and inheritance of sex: B1.2 • Inherited disorders: B1.3
<p>Descriptions of mitosis and meiosis are covered in relation to gamete formation, the restoration of the normal number of chromosomes at fertilisation and formation of an embryo.</p> <p>Both specifications describe a gene as a section of DNA that codes for a specific protein.</p> <p>Genetic inheritance is covered in a similar way, including the terminology associated with genetic crosses. Both specifications require analysis and</p>	

New AQA specification	Current OCR specifications
<p>calculations of outcomes of crosses.</p> <p>Specifications consider inherited disorders, including the use and implications of genetic screening.</p> <p>Sex determination is covered in both specifications.</p>	
Description of sexual and asexual reproduction.	Asexual reproduction is only mentioned in terms of clones.
AQA specification doesn't mention how proteins are synthesized.	<p>The structure of DNA in terms of base pairs and how the sequence of bases codes for amino acids and proteins.</p> <p>The function of mRNA.</p> <p>The function of non-coding parts of DNA.</p>
The importance of the human genome in linking genes to particular diseases, treatment of inherited disorders and tracing migration patterns.	There is no reference to the human genome.
<p>AQA specification covers polydactyly and cystic fibrosis as examples of inherited disorders.</p> <p>Students are required to understand family trees.</p>	<p>OCR specification covers Huntington's disease and cystic fibrosis as examples of inherited disorders.</p> <p>There is more detail about the types of genetic screening that can be carried out and the implications of its use by individuals, employers and insurance companies.</p>

4.6.2 Variation and evolution

New AQA specification	Current OCR specifications
Specification reference: 4.6.2.1 to 4.6.2.4	<p>Specification reference:</p> <ul style="list-style-type: none"> • Variation: B1.1 and B3.2 • Evolution, natural selection and selective breeding: B3.2 • Cloning: B1.4 and B5.1

New AQA specification	Current OCR specifications
Genetic and environmental variations, including the effect of mutations. Darwin's theory of evolution by natural selection and selective breeding.	
N/A	Many characteristics are determined by several genes working together, eg eye colour.
AQA specification covers the process of selective breeding with examples and the problems of in-breeding in detail.	The similarities and differences between natural selection and selective breeding.
Genetic engineering examples include disease, pest and pesticide resistance in plants, human insulin production and research exploring the use of genetic modification to overcome some inherited diseases. The advantages and disadvantages of the process.	Genetic engineering is not covered.
Clones are only mentioned in relation to stem cells in 4.1.2.3 and asexual reproduction in 4.6.1.1.	OCR specification describes but doesn't name adult cell cloning. Cloning in plants, limited to bulbs, runners and cuttings. Identical twins are natural clones.

4.6.3 The development and understanding of genetics and evolution

New AQA specification	Current OCR specifications
Specification reference: 4.6.3.1 to 4.6.3.4	Specification reference: <ul style="list-style-type: none"> • Darwin, natural selection and evidence: B3.2 • Extinction: B3.1 and B3.3
Darwin's theory of evolution by natural selection, and evidence for evolution, including the fossil record. The causes of extinction.	
N/A	Lamarck's theory.

New AQA specification	Current OCR specifications
Evidence for evolution includes genetic inheritance, the fossil record and antibiotic resistant bacteria. How fossils can be formed.	Evidence for evolution includes the fossil record and analysis of DNA.
N/A	The rate of extinction is increasing and is likely to be due to human activity.
The development of strains of bacteria resistant to antibiotics. How we could reduce their rate of development and why we do not have antibiotics to treat them.	OCR specification refers only to the misuse of antibiotics.

4.6.4 Classification of living organisms

New AQA specification	Current OCR specifications
Specification reference: 4.6.4.1	Specification reference: <ul style="list-style-type: none"> Species: B3.1 Classification: B3.3
Organisms can be classified into groups based on their physical features and DNA. Organisms are classified into smaller and smaller groups, from kingdoms to species.	
<p>Why and how new models of classification have been developed due to improvements in microscopes and chemical analysis.</p> <p>The Linnaean system classifies organisms into: kingdom, phylum, class, order, family, genus and species.</p> <p>Organisms are named by the binomial system of genus and species.</p> <p>The three-domain system developed by Woese.</p>	<p>OCR specification requires only the taxa kingdom and species. The definition of species is given in B3.1</p> <p>Classification helps to make sense of</p>

How evolutionary trees are used to show how organisms are related.	the diversity of organisms and show evolutionary relationships.
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Ecology

4.7.1 Adaptations, interdependence and competition

New AQA specification	Current OCR specifications
Specification reference: 4.7.1.1 to 4.7.1.4	Specification reference: Adaptations, interdependence and competition: B3.1
How organisms are adapted to survive in their habitats and the interdependence of organisms. Competition for resources.	
Understand a wide range of terms related to ecology. The effect of changes in biotic and abiotic factors on communities. Adaptations may be structural, behavioural or functional. Extremophiles are adapted to survive high temperature, pressure or salt concentration.	Explain interdependence using food webs.
Definition of stable community.	N/A

4.7.2 Organisation of an ecosystem

New AQA specification	Current OCR specifications
Specification reference: 4.7.2.1 to 4.7.2.2	Specification reference: <ul style="list-style-type: none"> • Energy transfer in food chains and ecosystems: B3.1 • Fieldwork: B4.2 • Carbon and nitrogen cycles: B3.1
Feeding relationships, use of quadrats and the carbon cycle.	

New AQA specification	Current OCR specifications
<p>There is a required practical to investigate the population size of a common species in a habitat. The practical mentions to use transect, but it doesn't specify other techniques.</p> <p>Interpreting predator-prey cycles.</p> <p>The carbon, water and decay cycles are covered, but not the nitrogen cycle.</p>	<p>Measurement of environmental factors and living indicators of environmental change.</p> <p>OCR specification covers in detail the carbon and nitrogen cycles.</p>

4.7.3 Biodiversity and the effect of human interaction on ecosystems

New AQA specification	Current OCR specifications
<p>Specification reference: 4.7.3.1 to 4.7.3.6</p>	<p>Specification reference: Biodiversity: B3.3</p>
<p>The importance of maintaining biodiversity for future generations. Sustainable development can be improved by reducing pollution and conserving resources.</p>	
<p>This section focuses mainly on the effect of an increasing population on waste management and the need to reduce pollution from a range of sources.</p> <p>Land use and maintaining peat bogs and other habitats.</p> <p>Deforestation and global warming, including how they impact on biodiversity.</p> <p>Programmes to maintain biodiversity.</p>	<p>Environmental change can be measured using living and non-living indicators.</p> <p>Improving sustainability.</p>