

INTERNATIONAL GCSE

Human Biology (9-1)

SPECIFICATION

Pearson Edexcel International GCSE in Human Biology (4HB1)

For first teaching September 2017

First examination June 2019



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Edexcel, BTEC and LCCI qualifications

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Acknowledgements

This specification has been produced by Pearson on the basis of consultation with teachers, examiners, consultants and other interested parties. Pearson would like to thank all those who contributed their time and expertise to the specification's development.

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1 About this specification

The Pearson Edexcel International GCSE in Human Biology is part of a suite of International GCSE qualifications offered by Pearson.

This qualification is not accredited or regulated by any UK regulatory body.

This specification includes the following key features.

Structure: the Pearson Edexcel International GCSE in Human Biology is a linear qualification. Two written examinations must be taken in the same series at the end of the course of study.

Content: relevant, engaging and up to date.

Assessment: untiered, written examinations with questions designed to be accessible to students of all abilities.

Approach: a solid basis for students wishing to progress to the Pearson Edexcel AS and Advanced GCE Level or equivalent qualifications, focusing on key human biology theory.

Specification updates

This specification is Issue 1 and is valid for the Pearson Edexcel International GCSE in Human Biology examined from 2019. If there are any significant changes to the specification Pearson will inform centres. Changes will also be posted on our website.

For more information, please visit qualifications.pearson.com

Using this specification

This specification has been designed to give guidance to teachers and encourage effective delivery of the qualification. The following information will help you get the most out of the content and guidance.

Content: this is arranged as twelve topics in *2: Human Biology content*. As a minimum, all the bullet points in the content must be taught. The word 'including' in the content helps specify the detail of what must be covered.

Examples: throughout the content we have included examples of what could be covered or what might support teaching and learning. It is important to note that examples are for illustrative purposes only and that centres can use other examples. We have included examples that are easily understood and recognised by international centres.

Practical investigations: these are included in *2: Human Biology content* as specification points in italics. Students will develop knowledge and understanding of experimental skills through the context of the human biology they are learning. Experimental skills are assessed through written examinations.

Course introduction

The Pearson Edexcel International GCSE in Human Biology is designed for use in schools and colleges. It is part of a suite of International GCSE qualifications offered by Pearson.

The course gives students the opportunity to experience human biology within the context of their general education.

Other International GCSE Science qualifications are also offered by Pearson. These include the Pearson Edexcel International GCSE in Science (Single Award), International GCSE in Science (Double Award), International GCSE in Biology, International GCSE in Chemistry and International GCSE in Physics.

Qualification aims and objectives

The aims and objectives of this qualification are to enable students to:

- learn about human body systems and how they interact to support the healthy functioning of an individual and apply this knowledge in new and changing situations
- acquire knowledge and understanding of human biological facts, terminology, systems and practical techniques
- apply the principles and concepts of biology in relation to the health of individuals and populations in different contexts
- evaluate biological information, making judgements for the implications for human biology on the basis of this information
- appreciate the practical nature of human biology, developing experimental and investigative skills based on correct and safe laboratory techniques
- know that practical work carried out directly on humans is limited due to ethical and moral considerations
- analyse, interpret and evaluate data and experimental methods, drawing conclusions that are consistent with evidence from experimental activities and suggesting possible improvements and further investigations
- recognise the importance of accurate experimental work and reporting as scientific methods in human biology
- select, organise and present relevant information clearly and logically using appropriate vocabulary, definitions and conventions
- develop a logical approach to problem solving in a wider context
- select and apply appropriate areas of mathematics relevant to human biology as set out under each topic
- prepare for more advanced courses in biology and for other courses that require knowledge of human biology, such as health and social care.

Why choose Edexcel qualifications?

Pearson – the world’s largest education company

Edexcel academic qualifications are from Pearson, the UK’s largest awarding organisation. With over 3.4 million students studying our academic and vocational qualifications worldwide, we offer internationally recognised qualifications to schools, colleges and employers globally.

Pearson is recognised as the world’s largest education company, allowing us to drive innovation and provide comprehensive support for Edexcel students to acquire the knowledge and skills they need for progression in study, work and life.

A heritage you can trust

The background to Pearson becoming the UK’s largest awarding organisation began in 1836, when a royal charter gave the University of London its first powers to conduct exams and confer degrees on its students. With over 150 years of international education experience, Edexcel qualifications have firm academic foundations, built on the traditions and rigour associated with Britain’s education system.

Results you can trust

Pearson’s leading online marking technology has been shown to produce exceptionally reliable results, demonstrating that, at every stage, Edexcel qualifications maintain the highest standards.

Developed to Pearson’s world class qualifications standards

Pearson’s world-class standards mean that all Edexcel qualifications are developed to be rigorous, demanding, inclusive and empowering. We work collaboratively with a panel of education thought leaders and assessment experts to ensure that Edexcel qualifications are globally relevant, represent world-class best practice and maintain a consistent standard.

For more information on the world class qualification process and principles, please go to *Appendix 2: Pearson World Class Qualification design principles* or visit our website: uk.pearson.com/about-us/news-and-policy/reports-and-campaigns/world-class-qualifications/design-principles.html

Why choose Pearson Edexcel International GCSE in Human Biology?

We have listened to feedback from all parts of the International and UK school subject community, including a large number of teachers. We’ve made changes that will engage students and give them skills that will support progression to further study in biology and a range of other subjects, in biological sciences and elsewhere. Our content and assessment approach has been designed to meet students’ needs and to be consistent with our approach across the sciences.

At Pearson, all of our International GCSE science qualifications in Biology, Human Biology, Chemistry and Physics, as well as our Single and Double awards, have been designed to meet different students' needs. This specification has been designed to complement our International GCSE in Biology by providing a distinct specialist qualification that focuses on Human Biology which can be taken alongside or as an alternative. Our International GCSE in Human Biology is especially suitable for students wishing to progress to further scientific study in Biology, or to more specific scientific and technical careers such as: medicine, dentistry, physiology, genetics and epidemiology. The content and assessment approach in all our science qualifications has been designed to meet students' needs in the following ways:

- Content that is interesting and engaging for students but is also designed to ensure good preparation, both for those continuing to further study and for those wishing to work in human biology-related fields.
- There are opportunities to 'localise' the content to make it more relevant for students in their own country.
- Question papers are clear and straightforward – our question papers are clear and accessible for all students of all ability ranges and learning styles. Our mark schemes are straightforward, so that the assessment requirements are clear.
- Students' skills are broadly developed – we have designed the International GCSE to extend students' knowledge by broadening and deepening skills, for example:
 - developing students' practical skills by including a number of practicals in the specification content. These can be supplemented with other suggested practicals. The skills developed will be assessed through questions in written examinations
 - improving students' analytical and logic skills by applying understanding of scientific concepts and principles to a range of situations. This will include some examination questions that are more problem solving in style
 - addressing the need for mathematical skills to complement students' human biology skills by covering a range of mathematical areas.

Progression to A Level – International GCSEs enable successful progression to A Level and beyond. Through our World Class Qualification development process we have consulted with International Advanced Level and GCE A Level teachers as well as higher education professors to validate the appropriateness of the qualification including its content, skills development and assessment structure.

Courses to suit your students' needs and interests – teachers of biology have a choice of International GCSE courses to deliver, each giving different levels of depth to meet students' needs. As well as the Pearson Edexcel International GCSE in Human Biology, students can also be taught our International GCSE in Biology. In addition, some of the Human Biology content may appear in our International GCSE in Science (Double Award) or Science (Single Award). These courses offer a reduced amount of content, but are assessed to the same standard. Progression routes for these courses may vary slightly from those for the Pearson Edexcel International GCSEs in Human Biology and Biology.

More information about all our qualifications can be found on our Edexcel International GCSE pages at qualifications.pearson.com

Supporting you in planning and implementing this qualification

Planning

- We will give you a course planner and editable schemes of work.
- Our mapping documents highlight key differences between the new and the 2011 legacy qualifications.

Teaching and learning

- Our *Getting Started Guide* gives you an overview of the Pearson Edexcel International GCSE in Human Biology to help you understand the changes to content and assessment, and what these changes mean for you and your students.
- Print and digital learning and teaching resources promote any time, any place learning to improve student motivation and encourage new ways of working.

Preparing for exams

We will also give you a range of resources to help you prepare your students for the assessments, including:

- specimen papers to support formative assessments and mock exams
- examiner commentaries following each examination series.

ResultsPlus

ResultsPlus provides the most detailed analysis available of your students' exam performance. It can help you to identify the topics and skills where further learning would benefit your students.

examWizard

This is a free online data bank of past exam questions designed to support students and teachers with exam preparation and assessment.

Training events

In addition to online training, we host a series of training events each year (both online and face-to-face) that give teachers a deeper understanding of our qualifications.

Get help and support

Our subject advisor service ensures that you receive help and guidance from us. You can sign up to receive the Edexcel newsletter to keep up to date with our qualifications and receive product and service news.

Qualification at a glance

The Pearson Edexcel International GCSE in Human Biology comprises two externally-assessed papers:

- Human Biology Paper 1
- Human Biology Paper 2.

Paper overview

Human Biology Paper 1	*Paper code 4HB1/01
<ul style="list-style-type: none">• Externally assessed• Availability: January and June• First assessment: June 2019	50% of the total International GCSE
Content summary 1 Cells and tissues 2 Biological molecules 3 Movement of substances in and out of cells 4 Bones, muscles and joints 5 Coordination 6 Nutrition and energy 7 Respiration 8 Gas exchange 9 Internal transport 10 Homeostatic mechanisms 11 Reproduction and heredity 12 Disease	
Assessment <ul style="list-style-type: none">• The paper is assessed through a 1-hour 45-minute written examination paper set and marked by Pearson.• The total number of marks is 90.• A mixture of different question styles, including multiple-choice questions, short-answer questions, calculations and extended open-response questions.• A calculator may be used in the examinations.	

Human Biology Paper 2	*Paper code 4HB1/02
<ul style="list-style-type: none"> • Externally assessed • Availability: January and June • First assessment: June 2019 	50% of the total International GCSE
<p>Content summary</p> <ol style="list-style-type: none"> 1 Cells and tissues 2 Biological molecules 3 Movement of substances in and out of cells 4 Bones, muscles and joints 5 Coordination 6 Nutrition and energy 7 Respiration 8 Gas exchange 9 Internal transport 10 Homeostatic mechanisms 11 Reproduction and heredity 12 Disease 	
<p>Assessment</p> <ul style="list-style-type: none"> • The paper is assessed through a 1-hour 45-minute written examination paper set and marked by Pearson. • The total number of marks is 90. • A mixture of different question styles, including multiple-choice questions, short-answer questions, calculations, comprehension and extended open-response questions. • A calculator may be used in the examinations. 	

* See *Appendix 1: Codes* for a description of this code and all the other codes relevant to this qualification.

2 Human Biology content

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12	Disease	20

1 Cells and tissues

Students should:	
1.1	recognise cell structures as seen with a light microscope and electron microscope (TEM images only), including nucleus, chromosomes, cell membrane, mitochondria, endoplasmic reticulum and ribosomes
1.2	describe the functions of the cell structures: <ul style="list-style-type: none">• nucleus• chromosomes• cell membrane• mitochondria• endoplasmic reticulum• ribosomes.
1.3	describe the structure of a DNA molecule as: <ul style="list-style-type: none">• two strands coiled to form a double helix• containing nucleotides• strands linked by complementary bases• complementary bases linked by hydrogen bonds.
1.4	describe DNA replication as the separation of DNA strands and the formation of a new strand by complementary base pairing of nucleotides, including the role of DNA polymerase
1.5	understand that a gene is a length of DNA containing a sequence of bases that code for a specific protein. <i>teaching should be limited to:</i> <ul style="list-style-type: none">• <i>the order of bases in DNA codes for the order of amino acids in a protein</i>• <i>3 bases coding for one amino acid.</i>
1.6	know that RNA is a second type of nucleic acid that has the following features: <ul style="list-style-type: none">• single stranded• contains ribose• contains uracil and that it is used to take information from DNA in the nucleus to the ribosomes for the synthesis of proteins.
1.7	understand that a DNA mutation involves a change in the sequence of bases that could lead to a change in the amino acid sequence and phenotype of an individual
1.8	describe protein synthesis as: <ul style="list-style-type: none">• transcription – the formation of mRNA in the nucleus• the transfer of mRNA to ribosomes in the cytoplasm• translation of the genetic code by tRNA from mRNA codons• the formation of a polypeptide chain using amino acids.

Students should:	
1.9	outline principles of genetic engineering, including: <ul style="list-style-type: none"> the production of genetically modified bacteria to produce human insulin the production of genetically modified plants to produce vaccines (e.g. hepatitis B) and to improve health (e.g. Golden Rice to increase Vitamin A in the diet)
1.10	understand that mitosis occurs during growth, repair, cloning and asexual reproduction
1.11	know the four main stages of mitosis; prophase, metaphase, anaphase and telophase, which results in the production of two genetically identical diploid daughter cells
1.12	know that there are different types of stem cells, including embryonic and adult stem cells that have the ability to develop into other body cells
1.13	describe the advantages, disadvantages and ethics in the research and use of embryonic and adult stem cells
1.14	understand that cells are grouped into tissues and that tissues are organised into organs
1.15	describe the structure of bone, muscle (voluntary, involuntary and cardiac, as observed under a light microscope), blood, nervous tissue and epithelium (squamous and ciliated, with reference to cells lining the cheek and trachea)
1.16	describe the structure of cells specialised for reproduction, e.g. egg (ovum) and sperm and relate their structure to function

2 Biological molecules

Students should:	
2.1	know the chemical elements present in carbohydrates, proteins and lipids (fats and oils)
2.2	understand the structure of carbohydrates, proteins and lipids as large molecules made up from smaller basic units: <ul style="list-style-type: none"> starch and glycogen from simple sugars protein from amino acids lipids from fatty acids and glycerol.
2.3	describe the tests for glucose (a reducing sugar), starch, lipid and protein
2.4	<i>practical: investigate the qualitative and quantitative content of vitamin C in food</i>
2.5	<i>practical: investigate the energy content of food</i>
2.6	explain the role of enzymes as biological catalysts in metabolic reactions
2.7	explain the action of enzymes and how their activity is affected by: <ul style="list-style-type: none"> temperature pH substrate concentration competitive and non-competitive inhibitors.

Students should:	
2.8	<i>practical: investigate the effect of temperature and pH on enzyme activity</i>
2.9	describe the advantages of using immobilised enzymes in: <ul style="list-style-type: none"> • the production of lactose-free milk • the conversion of sucrose into glucose and fructose • glucose testing strips for diabetics.
2.10	<i>practical: investigate the action of immobilised enzymes including the preparation of alginate beads</i>

3 Movement of substances into and out of cells

Students should:	
3.1	know simple definitions of diffusion, osmosis and active transport
3.2	understand that movement of substances into and out of cells can be by diffusion, osmosis (understanding of water potential is required) and active transport
3.3	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

4 Bones, muscles and joints

Students should:	
4.1	describe the structure and function of the main parts of the skeleton: <ul style="list-style-type: none"> • axial skeleton (vertebral column, ribcage and skull) • appendicular skeleton (scapula, clavicle, pelvis and limbs) • the structure of a long bone to include the distribution of spongy bone, compact bone and epiphysis.
4.2	explain the functions of joints using the elbow, shoulder and a cartilaginous intervertebral joint as examples
4.3	describe the structure of a synovial joint
4.4	explain the relationship between voluntary muscles and bones to bring about movement illustrated by the biceps and triceps muscles and associated bones in the arm and shoulder
4.5	understand the dietary factors controlling the healthy development of muscle and bone
4.6	understand the causes and symptoms of osteoporosis

5 Coordination

Students should:	
5.1	know the structure of neurones: sensory, motor and relay
5.2	know the basic plan of the central nervous system
5.3	know the main areas of the brain and their functions including the cerebral hemispheres, cerebellum, mid brain, pituitary gland and hypothalamus
5.4	know the structure and functions of the spinal cord and the structure of a reflex arc
5.5	understand that the body contains receptors that can detect the stimuli for light, temperature, pressure/pain and taste
5.6	describe the pathway taken by a nerve impulse to cause a response to a stimulus
5.7	<i>practical: investigate the number and position of sensory receptors, such as touch and temperature receptors in the skin</i>
5.8	understand how nerve impulses are initiated, the direction of movement of an impulse along a neurone and transmission across a synapse
5.9	understand the action of hormones from the pituitary (ADH and gonadotrophic hormones), adrenal (adrenaline) and thyroid glands, the islets of Langerhans in the pancreas (insulin and glucagon) and the gonads, and know the role of hormones in growth and development
5.10	understand between the nervous and hormonal systems
5.11	explain the structure and function of the eye in: <ul style="list-style-type: none"> • focusing on near and distant objects • responding to changes in light intensity • stereoscopic vision allowing better judgment of distance.
5.12	understand eye defects and their treatment, i.e. long sight, short sight, astigmatism, and cataracts, and the use of corneal transplants
5.13	explain the structure and function of the ear in balance and hearing
5.14	understand how prolonged exposure to high noise levels affects the functioning of the ear and hearing
5.15	<i>practical: investigate the range of frequency audible to the human ear</i>
5.16	understand the meaning of the term 'drug' and distinguish between legal and illegal drugs, including: <ul style="list-style-type: none"> • the dangers of heroin, cannabis and cocaine • the action of common painkillers such as paracetamol on the nervous system.
5.17	describe the damaging effects of alcohol on the nervous system and liver and the behavioural consequences of excessive and long-term drinking
5.18	describe the causes, symptoms and treatments of mental illness, including schizophrenia and depression
5.19	describe the causes, symptoms and treatments of Alzheimer's disease, vascular dementia and Parkinson's disease

6 Nutrition and energy

Students should:	
6.1	explain the importance of a balanced diet including the recommended dietary intake of carbohydrates, fats, proteins, vitamins A and C, calcium, iron and fibre
6.2	understand variations in diet related to age, pregnancy, climate and occupation
6.3	know the sources and functions of carbohydrates, proteins, lipids (fats and oils), vitamins A, C and D, and the mineral ions, calcium and iron
6.4	describe the causes and symptoms of deficiency diseases limited to scurvy (lack of vitamin C), anaemia (lack of iron), blindness (lack of vitamin A) and Kwashiorkor (lack of protein)
6.5	know the structures of the human alimentary canal and describe the functions of the mouth, oesophagus, stomach, small intestine, large intestine and pancreas in digestion
6.6	explain how food is moved through the gut by peristalsis including the role of dietary fibre in the process
6.7	understand the role of digestive enzymes including: <ul style="list-style-type: none">• their site of production and action• the digestion of starch to glucose by amylase and maltase• the digestion of proteins to amino acids by proteases (pepsin, trypsin)• the digestion of lipids to fatty acids and glycerol by lipases.
6.8	know 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
6.9	understand how the structure of the villus helps absorption of the products of digestion in the small intestine
6.10	know the types, structure and functions of teeth, the factors that affect their growth and how to care for teeth and gums
6.11	understand BMI, including the calculation of BMI, and the role of obesity as a risk factor in early onset of diabetes and the significance of high cholesterol levels in atherosclerosis
6.12	explain the importance of hygienic methods of food preparation, cooking, storage and preservation

7 Respiration

Students should:	
7.1	know that the process of respiration releases energy in living organisms
7.2	<i>practical: investigate the difference between inspired and expired air for carbon dioxide concentration</i>
7.3	know the word equation and the balanced chemical symbol equation for aerobic respiration in living organisms
7.4	know the word equation for anaerobic respiration
7.5	explain the differences between aerobic and anaerobic respiration
7.6	understand the role of ATP in energy transfer (addition and removal of a phosphate group and associated energy requirement and release)

8 Gas exchange

Students should:	
8.1	know the structure of the thorax including the ribs, intercostal muscles, diaphragm, trachea, bronchi, bronchioles, alveoli and pleural membranes
8.2	explain the role of the intercostal muscles and the diaphragm in ventilation
8.3	explain how the lungs are adapted for gas exchange by diffusion
8.4	understand the terms lung capacity, vital capacity, tidal volume and interpret spirometer traces showing breathing movement
8.5	<i>practical: investigate the effect of exercise on the rate of breathing and measure lung capacity</i>
8.6	describe the regulation of carbon dioxide content in the blood including the role of chemoreceptors in the aorta and carotid arteries
8.7	understand the term aerobic exercise
8.8	understand the long-term benefits of exercise on the cardiovascular system
8.9	understand the pulse rate as a measure of heart rate and explain why resting pulse can be used as a measure of physical fitness
8.10	explain why the heart rate changes during exercise and the influence of adrenaline
8.11	<i>practical: investigate the effect of exercise on the pulse rate</i>
8.12	understand how an oxygen debt arises and how it is repaid after exercise
8.13	understand the damage to the respiratory and cardiovascular system caused by smoking

9 Internal transport

Students should:	
9.1	know the composition of the blood: red blood cells (erythrocytes), white blood cells (phagocytes and lymphocytes), platelets and plasma
9.2	understand the role of plasma in the transport of carbon dioxide, digested food, urea, hormones and heat energy
9.3	know the role of tissue fluid and explain how this arises as a result of pressure differences and its subsequent drainage into the lymphatic system
9.4	explain how red blood cells are adapted for oxygen transport
9.5	understand the role of ABO blood groups and their importance in blood transfusions
9.6	understand the role of white blood cells including phagocytosis and antibody production (details of plasma cells are not required)
9.7	describe the importance of blood clotting and the role of enzymes in causing the conversion of fibrinogen into fibrin (the names of other intermediates and enzyme names are not required)
9.8	compare the structures of arteries, veins and capillaries, and understand their roles including the pulse
9.9	know the general plan of the circulatory system to include the blood vessels to and from the heart, the lungs, the liver and the kidneys
9.10	know the structure of the heart and how it functions
9.11	describe the causes, prevention and treatment of heart disease including: <ul style="list-style-type: none">• the effect of diet and exercise• the use of stents, artificial hearts and transplants.
9.12	understand the problems associated with heart transplants
9.13	describe the use of statins and plant stanol esters in the treatment and prevention of circulatory disorders
9.14	understand the role of beta-blockers in the treatment of circulatory disorders, e.g. heart failure and angina
9.15	explain the terms systolic and diastolic blood pressure
9.16	describe the causes, prevention and treatment of hypertension
9.17	understand the role of ACE inhibitors in the treatment of high blood pressure
9.18	describe how monoclonal antibodies are produced
9.19	understand how monoclonal antibodies work to detect and treat diseases such as cancer

10 Homeostatic mechanisms

Students should:	
10.1	know the structure and functions of the skin and explain the role of sweat glands, vasoconstriction, vasodilation and shivering in temperature regulation
10.2	know the definition of excretion; the removal of metabolic waste, including urea, carbon dioxide and water
10.3	know the structure and functions of the renal system
10.4	explain why the composition of urine may vary
10.5	describe the role of the hypothalamus and pituitary gland in osmoregulation
10.6	explain the role of ADH in regulating the water content of the blood
10.7	understand the roles of insulin and glucagon in maintaining blood glucose levels
10.8	understand the concept of homeostasis and the role of negative feedback, with particular reference to temperature control and blood glucose concentration
10.9	describe the advantages and disadvantages of: <ul style="list-style-type: none">• kidney transplants• kidney dialysis.
10.10	<i>practical: investigate diffusion using a partially-permeable membrane such as Visking tubing</i>
10.11	describe the functions of the liver in bile production, regulation of blood sugar, urea formation and detoxification including the breakdown of alcohol

11 Reproduction and heredity

Students should:	
11.1	know that the process of fertilisation involves the fusion of a male and female gamete to produce a zygote
11.2	describe how a zygote divides to form an embryo
11.3	know the stages of meiosis allowing the production of haploid gametes and its significance in bringing about variation in a species
11.4	know the structure and function of the male and female reproductive systems
11.5	understand the roles of oestrogen, progesterone, FSH and LH in the menstrual cycle
11.6	explain the role in pregnancy of the: <ul style="list-style-type: none"> • hormone progesterone • placenta • amniotic fluid • umbilical cord.
11.7	know the roles of oestrogen and testosterone in the development of secondary sexual characteristics
11.8	describe the birth process and explain the advantages of breast feeding
11.9	describe an outline of growth and development to maturity, to include growth curves for humans
11.10	describe the methods of contraception by hormonal, barrier and natural methods, intra-uterine devices and sterilisation
11.11	describe the advantages and disadvantages of each contraceptive method
11.12	describe the process of IVF and how it can improve the chances of pregnancy
11.13	know that genes exist in alternative forms called alleles which give rise to differences in inherited characteristics
11.14	know the meaning of the terms dominant, recessive, homozygous, heterozygous, phenotype, genotype, co-dominance, diploid and haploid
11.15	know that the sex of a person is controlled by one pair of chromosomes, XX in a female and XY in a male
11.16	explain how the sex of offspring is determined at fertilisation using a genetic diagram
11.17	understand that random fertilisation produces genetic variation of offspring
11.18	understand the role of multiple alleles in the inheritance of ABO blood groups
11.19	understand patterns of monohybrid inheritance using a genetic diagram and the probabilities of outcomes
11.20	understand how to interpret family pedigrees
11.21	describe the causes and effects of inherited conditions such as haemophilia and red-green colour blindness (sex-linked inheritance), polydactyly (dominant allele) and cystic fibrosis (recessive allele)
11.22	describe how gene therapy with viruses can be used to treat cystic fibrosis
11.23	understand that random fertilisation produces genetic variation of offspring
11.24	understand that variation within a species can be genetic, environmental or a combination of both

12 Disease

Students should:	
12.1	understand the general course of a disease as: infection, incubation and symptoms
12.2	know that diseases are caused by pathogenic microorganisms
12.3	describe the structure and reproduction of viruses
12.4	describe methods of transmission, treatment and prevention of the spread of Ebola and HIV (human immuno-deficiency virus), the virus that causes AIDS
12.5	describe the structure, nutrition and reproduction of bacteria including the interpretation of bacterial growth curves
12.6	investigate the effects of antibacterial agents and antibiotics on the growth of bacterial culture
12.7	know the methods of transmission, treatment and prevention of the spread of cholera and gonorrhoea
12.8	explain the importance of oral rehydration therapy
12.9	know the methods of transmission, treatment and prevention of the spread of athlete's foot
12.10	explain the role of the mosquito (malaria) and housefly (typhoid) in transmitting causative agents of disease
12.11	describe the treatment and prevention of the spread of malaria and typhoid
12.12	understand the antibody-antigen reaction
12.13	explain how vaccines work to prevent the spread of disease
12.14	understand the differences between natural and artificial immunity and active and passive immunity
12.15	know the sources and role of antibiotics
12.16	explain how resistant pathogens such as MRSA arise and why they are a cause for concern
12.17	understand the role of non-pathogenic bacteria and fungi (decomposers) useful to humans in the decomposition of organic matter <i>details of other bacteria in the nitrogen and carbon cycles are not required</i>
12.18	know the processes of sewage treatment in modern sewage works and a pit latrine including the role of aerobic and anaerobic microorganisms in sewage breakdown

3 Assessment information

Assessment requirements

Paper number	Level	Assessment information	Number of marks allocated in the paper
Paper 1	1/2	Assessed through a 1-hour and 45-minute written examination set and marked by Pearson. The paper is weighted at 50% of the qualification. A mixture of different question styles, including calculations multiple-choice, short-answer, and extended open-response questions.	90
Paper 2	1/2	Assessed through a 1-hour and 45-minute written examination set and marked by Pearson. The paper is weighted at 50% of the qualification. A mixture of different question styles, including calculations, multiple-choice, short-answer, comprehension and extended open-response questions.	90

The final mark for the Pearson Edexcel International GCSE in Human Biology is obtained by adding together the marks scored in Paper 1 and Paper 2. The raw marks are added together, with no scaling, to achieve a total mark for the qualification of 180 marks.

Grades are then awarded for the qualification, based on the overall mark. The grades available range from 1 (at the lower end of the ability range) up to 9.

Experimental skills

The best way to develop experimental skills is to embed practical investigations in teaching or theory. The development of knowledge and experimental skills can then happen together, leading to secure acquisition of both knowledge and skills.

Our practical investigations are embedded in *2: Human Biology content* as specification points in italics. The skills developed through these and other practicals will be assessed through written examinations.

In the assessment of experimental skills, students may be tested on their ability to:

- solve problems set in a practical context
- apply scientific knowledge and understanding in questions with a practical context
- devise and plan investigations, using scientific knowledge and understanding when 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 appropriate ways
- identify independent, dependent and control variables
- use scientific knowledge and understanding to analyse and interpret data to draw conclusions from experimental activities that are consistent with the evidence
- communicate the findings from experimental activities, using appropriate technical language, relevant calculations and graphs
- assess the reliability of an experimental activity
- evaluate data and methods taking into account factors that affect accuracy and validity.

Calculators

Students will be expected to have access to a suitable electronic calculator for all examination papers. Calculators that allow for the retrieval of text or formulae or QWERTY keyboards will not be allowed for use in examinations.

Assessment objectives and weightings

		International GCSE
A01	Knowledge and understanding of human biology	38–42%
A02	Application of knowledge and understanding, analysis and evaluation of human biology	38–42%
A03	Experimental skills, analysis and evaluation of data and methods in human biology	19–21%
		100%

Relationship of assessment objectives to units

Unit number	Assessment objective		
	A01	A02	A03
Human Biology Paper 1	19–21%	19–21%	9.5–10.5%
Human Biology Paper 2	19–21%	19–21%	9.5–10.5%
Total for International GCSE	38–42%	38–42%	19–21%

All components will be available for assessment from June 2019.

4 Administration and general information

Entries

Details of how to enter students for the examinations for this qualification can be found in our *International information manual*. A copy is made available to all examinations officers and is also available on our website.

Students should be advised that if they take two qualifications in the same subject, colleges, universities and employers are very likely to take the view that they have achieved only one of the two GCSEs/International GCSEs. Students or their advisers, who have any doubts about subject combinations should check with the institution to which they wish to progress before embarking on their programmes.

Students may take the Pearson Edexcel International GCSE in Human Biology alongside the International GCSE in Biology and International GCSE in Science (Double Award).

Access arrangements, reasonable adjustments, special consideration and malpractice

Equality and fairness are central to our work. Our Equality Policy requires all students to have equal opportunity to access our qualifications and assessments, and our qualifications to be awarded in a way that is fair to every student.

We are committed to making sure that:

- students with a protected characteristic (as defined by the UK Equality Act 2010) are not, when they are undertaking one of our qualifications, disadvantaged in comparison to students who do not share that characteristic
- all students achieve the recognition they deserve for undertaking a qualification and that this achievement can be compared fairly to the achievement of their peers.

Language of assessment

Assessment of this qualification will only be available in English. All student work must be in English.

We recommend that students are able to read and write in English at Level B2 of the Common European Framework of Reference for Languages.

Access arrangements

Access arrangements are agreed before an assessment. They allow students with special educational needs, disabilities or temporary injuries to:

- access the assessment
- show what they know and can do without changing the demands of the assessment.

The intention behind an access arrangement is to meet the particular needs of an individual student with a disability without affecting the integrity of the assessment. Access arrangements are the principal way in which awarding bodies comply with the duty under the UK Equality Act 2010 to make 'reasonable adjustments'.

Access arrangements should always be processed at the start of the course. Students will then know what is available and have the access arrangement(s) in place for assessment.

Reasonable adjustments

The UK Equality Act 2010 requires an awarding organisation to make reasonable adjustments where a student with a disability would be at a substantial disadvantage in undertaking an assessment. The awarding organisation is required to take reasonable steps to overcome that disadvantage.

A reasonable adjustment for a particular student may be unique to that individual and therefore might not be in the list of available access arrangements.

Whether an adjustment will be considered reasonable will depend on a number of factors, including:

- the needs of the student with the disability
- the effectiveness of the adjustment
- the cost of the adjustment
- the likely impact of the adjustment on the student with the disability and other students.

An adjustment will not be approved if it involves unreasonable costs to the awarding organisation or unreasonable timeframes or if it affects the security or integrity of the assessment. This is because the adjustment is not 'reasonable'.

Special consideration

Special consideration is a post-examination adjustment to a student's mark or grade to reflect temporary injury, illness or other indisposition at the time of the examination/assessment, which has had, or is reasonably likely to have had, a material effect on a candidate's ability to take an assessment or demonstrate their level of attainment in an assessment.

Further information

Please see our website for further information about how to apply for access arrangements and special consideration.

For further information about access arrangements, reasonable adjustments and special consideration, please refer to the JCQ website: www.jcq.org.uk

Candidate malpractice

Candidate malpractice refers to any act by a candidate that compromises or seeks to compromise the process of assessment, or undermines the integrity of the qualifications or the validity of results/certificates.

Candidate malpractice in examinations **must** be reported to Pearson using a *JCQ Form M1* (available at www.jcq.org.uk/exams-office/malpractice). The form can be emailed to pqsmalpractice@pearson.com or posted to: Investigations Team, Pearson, 190 High Holborn, London, WC1V 7BH. Please provide as much information and supporting documentation as possible. Note that the final decision regarding appropriate sanctions lies with Pearson.

Failure to report malpractice constitutes staff or centre malpractice.

Staff/centre malpractice

Staff and centre malpractice includes both deliberate malpractice and maladministration of our qualifications. As with candidate malpractice, staff and centre malpractice is any act that compromises or seeks to compromise the process of assessment, or undermines the integrity of the qualifications or the validity of results/certificates.

All cases of suspected staff malpractice and maladministration **must** be reported immediately, before any investigation is undertaken by the centre, to Pearson on a *JCQ Form M2* (available at www.jcq.org.uk/exams-office/malpractice).

The form, supporting documentation and as much information as possible can be emailed to pqsmalpractice@pearson.com or posted to: Investigations Team, Pearson, 190 High Holborn, London, WC1V 7BH. Note that the final decision regarding appropriate sanctions lies with Pearson.

Failure to report malpractice itself constitutes malpractice.

More-detailed guidance on malpractice can be found in the latest version of the document *General and Vocational Qualifications Suspected Malpractice in Examinations and Assessments*, available at www.jcq.org.uk/exams-office/malpractice

Awarding and reporting

The International GCSE qualification will be graded and certificated on a nine-grade scale from 9 to 1 using the total subject mark where 9 is the highest grade. Individual components are not graded. The first certification opportunity for the Pearson Edexcel International GCSE in Human Biology will be in June 2019. Students whose level of achievement is below the minimum judged by Pearson to be of sufficient standard to be recorded on a certificate will receive an unclassified U result.

Student recruitment and progression

Pearson's 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.

Prior learning and other requirements

The qualification builds on the content, knowledge and skills developed in the Key Stage 3 Programme of Study (ages 11–14) or international equivalences for science.

Progression

Students can progress from this qualification to:

- International Advanced Subsidiary, for example in Biology
- International Advanced Level, for example in Biology
- GCE Advanced Subsidiary, for example in Biology
- GCE Advanced Level, for example in Biology
- Level 3 vocational qualifications in science, for example BTEC Level 3 in Applied Science
- other comparable, Level 3 qualifications, such as the International Baccalaureate
- employment, for example in a science-based industry where an apprenticeship may be available.

Appendices

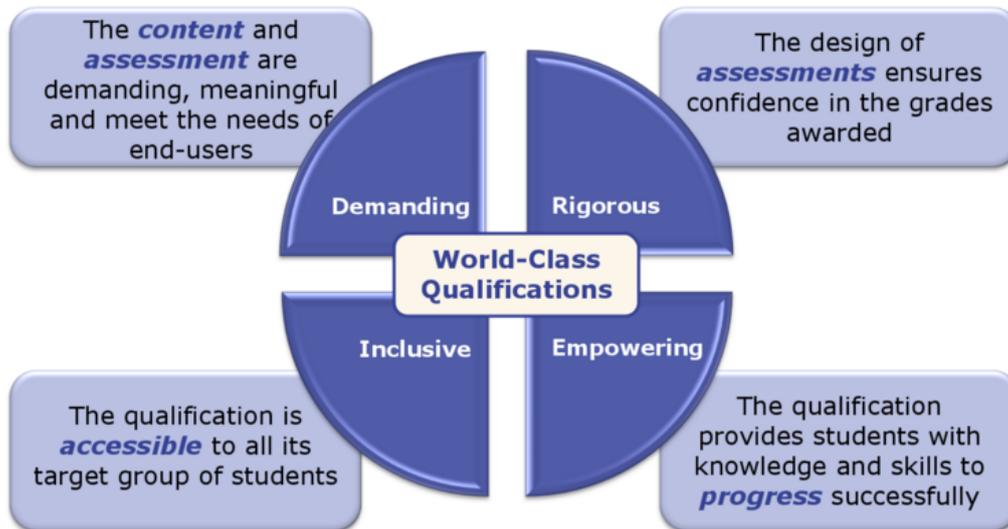
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Appendix 1: Codes

Type of code	Use of code	Code
Subject codes	The subject code is used by centres to enter students for a qualification.	Pearson Edexcel International GCSE in Human Biology – 4HB1
Paper codes	These codes are provided for information. Students may need to be entered for individual papers.	Human Biology Paper 1: 4HB1/01 Human Biology Paper 2: 4HB1/02

Appendix 2: Pearson World Class Qualification design principles

Pearson's World Class Qualification design principles mean that all Edexcel qualifications are developed to be **rigorous, demanding, inclusive and empowering**.



We work collaboratively to gain approval from an external panel of educational thought-leaders and assessment experts from across the globe. This is to ensure that Edexcel qualifications are globally relevant, represent world-class best practice in qualification and assessment design, maintain a consistent standard and support learner progression in today's fast changing world.

Pearson's Expert Panel for World Class Qualifications is chaired by Sir Michael Barber, a leading authority on education systems and reform. He is joined by a wide range of key influencers with expertise in education and employability.

"I'm excited to be in a position to work with the global leaders in curriculum and assessment to take a fresh look at what young people need to know and be able to do in the 21st century, and to consider how we can give them the opportunity to access that sort of education." Sir Michael Barber.

Endorsement from Pearson's Expert Panel for World Class Qualifications for the International GCSE development process

"We were chosen, either because of our expertise in the UK education system, or because of our experience in reforming qualifications in other systems around the world as diverse as Singapore, Hong Kong, Australia and a number of countries across Europe.

We have guided Pearson through what we judge to be a rigorous world class qualification development process that has included:

- extensive international comparability of subject content against the highest-performing jurisdictions in the world
- benchmarking assessments against UK and overseas providers to ensure that they are at the right level of demand
- establishing External Subject Advisory Groups, drawing on independent subject-specific expertise to challenge and validate our qualifications.

Importantly, we have worked to ensure that the content and learning is future oriented, and that the design has been guided by Pearson’s Efficacy Framework. This is a structured, evidenced process that means learner outcomes have been at the heart of this development throughout.

We understand that ultimately it is excellent teaching that is the key factor in a learner’s success in education, but as a result of our work as a panel, we are confident that we have supported the development of Pearson Edexcel International GCSE qualifications that are outstanding for their coherence, thoroughness and attention to detail and can be regarded as representing world-class best practice.”

<p>Sir Michael Barber (Chair) Chief Education Advisor, Pearson plc</p>	<p>Dr Peter Hill Former Chief Executive ACARA</p>
<p>Professor Sing Kong Lee Director, National Institute of Education, Singapore</p>	<p>Bahram Bekhradnia President, Higher Education Policy Institute</p>
<p>Professor Jonathan Osborne Stanford University</p>	<p>Dame Sally Coates Principal, Burlington Danes Academy</p>
<p>Professor Dr Ursula Renold Federal Institute of Technology, Switzerland</p>	<p>Professor Robin Coningham Pro-Vice Chancellor, University of Durham</p>
<p>Professor Bob Schwartz Harvard Graduate School of Education</p>	<p>Professor Janice Kay Provost, University of Exeter</p>
<p>Jason Holt CEO, Holts Group</p>	<p>Jane Beine Head of Partner Development, John Lewis</p>

Appendix 3: Transferable skills

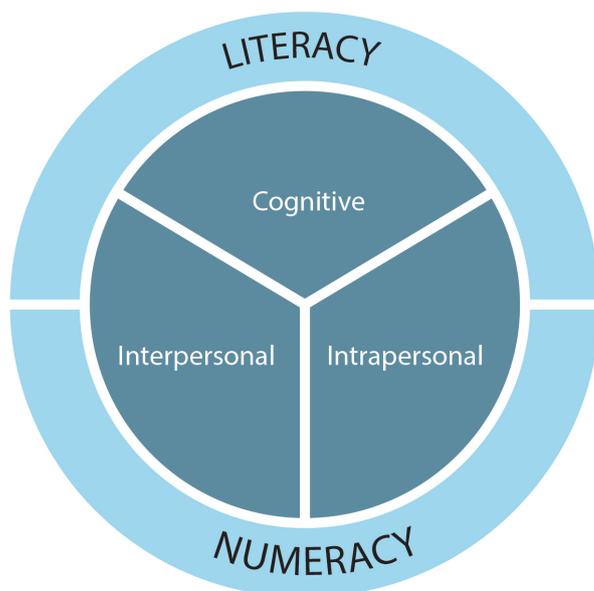
The need for transferable skills

In recent years, higher education institutions and employers have consistently flagged the need for students to develop a range of transferable skills to enable them to respond with confidence to the demands of undergraduate study and the world of work.

The Organisation for Economic Co-operation and Development (OECD) defines skills, or competencies, as 'the bundle of knowledge, attributes and capacities that can be learned and that enable individuals to successfully and consistently perform an activity or task and can be built upon and extended through learning'.^[1]

To support the design of our qualifications, the Pearson Research Team selected and evaluated seven global 21st-century skills frameworks. Following on from this process, we identified the National Research Council's (NRC) framework^[2] as being the most evidence-based and robust skills framework, and have used this as a basis for our adapted skills framework.

The framework includes cognitive, intrapersonal skills and interpersonal skills.
[The NRC are included alongside literacy and numeracy skills.]



The skills have been interpreted for this specification to ensure that they are appropriate for the subject. All of the skills listed are evident or accessible in the teaching, learning and/or assessment of the qualification. Some skills are directly assessed. Pearson materials will support you in identifying these skills and developing these skills in students.

The table overleaf sets out the framework and gives an indication of the skills that can be found in human biology and indicates the interpretation of the skill in this area. A full subject interpretation of each skill, with mapping to show opportunities for students' development is provided on the subject pages of our website.

¹ OECD, *Better Skills, Better Jobs, Better Lives* (2012): skills.oecd.org/documents/OECDSkillsStrategyFINALENG.pdf

² Koenig, J. A. *Assessing 21st Century Skills: Summary of a Workshop* (National Research Council, 2011)

Cognitive skills	Cognitive processes and strategies:	<ul style="list-style-type: none"> • Critical thinking • Problem solving • Analysis • Reasoning • Interpretation • Decision making • Adaptive learning • Executive function
	Creativity:	<ul style="list-style-type: none"> • Creativity • Innovation
Intrapersonal skills	Intellectual openness:	<ul style="list-style-type: none"> • Adaptability • Personal and social responsibility • Continuous learning • Intellectual interest and curiosity
	Work ethic/ conscientiousness:	<ul style="list-style-type: none"> • Initiative • Self-direction • Responsibility • Perseverance • Productivity • Self-regulation (metacognition, forethought, reflection) • Ethics • Integrity
	Positive core self-evaluation:	<ul style="list-style-type: none"> • Self-monitoring/self-evaluation/self-reinforcement
Interpersonal skills	Teamwork and collaboration:	<ul style="list-style-type: none"> • Communication • Collaboration • Teamwork • Co-operation • Interpersonal skills
	Leadership:	<ul style="list-style-type: none"> • Leadership • Responsibility • Assertive communication • Self-presentation

Decision making
Evaluating data and experimental methods and drawing conclusions, which are consistent with evidence from secondary sources and experimental activities. Suggest possible improvements and further investigations.

Self regulation
Developing and refining a strategy over time for applications of biology and to different contexts reflecting on the success or otherwise of the strategy.

Teamwork
Working with other students in practical work so that everyone's contribution is valued and effective.

Appendix 4: Mathematical skills

The table below identifies the mathematical skills that will be developed and assessed throughout this qualification. These are not explicitly referenced in the content. Details of the mathematical skills in the other science subjects are given for reference.

		HB	C	P
1	Arithmetic and numerical computation			
A	Recognise and use numbers in decimal form	✓	✓	✓
B	Recognise and use numbers in standard form	✓	✓	✓
C	Use ratios, fractions, percentages, powers and roots	✓	✓	✓
D	Make estimates of the results of simple calculations, without using a calculator	✓		✓
E	Use calculators to handle $\sin x$ and $\sin^{-1} x$, where x is expressed in degrees			✓
2	Handling data			
A	Use an appropriate number of significant figures	✓	✓	✓
B	Understand and find the arithmetic mean (average)	✓	✓	✓
C	Construct and interpret bar charts	✓	✓	✓
D	Construct and interpret frequency tables, diagrams and histograms	✓		✓
E	Understand the principles of sampling as applied to scientific data	✓		
F	Understand simple probability	✓	✓	✓
G	Understand the terms mode and median	✓		
H	Use a scatter diagram to identify a pattern or trend between two variables	✓	✓	✓
I	Make order of magnitude calculations	✓	✓	✓
3	Algebra			
A	Understand and use the symbols $<$, $>$, α , \sim		✓	✓
B	Change the subject of an equation	✓	✓	✓
C	Substitute numerical values into algebraic equations using appropriate units for physical quantities	✓	✓	✓
D	Solve simple algebraic equations	✓	✓	✓
4	Graphs			
A	Translate information between graphical and numerical form	✓	✓	✓
B	Understand that $y = mx + c$ represents a linear relationship		✓	✓
C	Plot two variables (discrete and continuous) from experimental or other data	✓	✓	✓
D	Determine the slope and intercept of a linear graph	✓	✓	✓
E	Understand, draw and use the slope of a tangent to a curve as a measure of rate of change		✓	✓
F	Understand the physical significance of area between a curve and the x -axis, and measure it by counting squares as appropriate			✓

		HB	C	P
5	Geometry and trigonometry			
A	Use angular measures in degrees			✓
B	Visualise and represent 2D and 3D objects, including two dimensional representations of 3D objects			✓
C	Calculate areas of triangles and rectangles, surface areas and volumes of cubes	✓		✓

Appendix 5: Command words

The following table lists the command words used in the external assessments.

Command word	Definition
Add/Label	Requires the addition or labelling of a stimulus material given in the question, e.g. labelling a diagram or adding units to a table.
Calculate	Obtain a numerical answer, showing relevant working.
Comment on	Requires the synthesis of a number of variables from data/information to form a judgement.
Complete	Requires the completion of a table/diagram.
Deduce	Draw/reach conclusion(s) from the information provided.
Describe	To give an account of something. Statements in the response need to be developed, as they are often linked but do not need to include a justification or reason.
Determine	The answer must have an element that is quantitative from the stimulus provided, or must show how the answer can be reached quantitatively. To gain maximum marks, there must be a quantitative element to the answer.
Design	Plan or invent a procedure from existing principles/ideas.
Discuss	<ul style="list-style-type: none"> Identify the issue/situation/problem/argument that is being assessed within the question. Explore all aspects of an issue/situation/problem/argument. Investigate the issue/situation etc. by reasoning or argument.
Draw	Produce a diagram either using a ruler or freehand.
Estimate	Find an approximate value, number or quantity from a diagram/given data or through a calculation.
Evaluate	Review information (e.g. data, methods) then bring it together to form a conclusion, drawing on evidence including strengths, weaknesses, alternative actions, relevant data or information. Come to a supported judgement of a subject's quality and relate it to its context.
Explain	An explanation requires a justification/exemplification of a point. The answer must contain some element of reasoning/justification – this can include mathematical explanations.
Give/State/Name	All of these command words are really synonyms. They generally all require recall of one or more pieces of information.
Give a reason/reasons	When a statement has been made and the requirement is only to give the reason(s) why.
Identify	Usually requires some key information to be selected from a given stimulus/resource.

Command word	Definition
Justify	Give evidence to support (either the statement given in the question or an earlier answer).
Plot	Produce a graph by marking points accurately on a grid from data that is provided and then draw a line of best fit through these points. A suitable scale and appropriately labelled axes must be included if these are not provided in the question.
Predict	Give an expected result.
Show that	Verify the statement given in the question.
Sketch	Produce a freehand drawing. For a graph, this would need a line and labelled axes with important features indicated. The axes are not scaled.
State what is meant by	When the meaning of a term is expected but there are different ways for how this can be described.
Suggest	Use your knowledge to propose a solution to a problem in a novel context.
Verb preceding a command word	
Analyse the data/graph to explain	Examine the data/graph in detail to provide an explanation.
Multiple choice questions	
What, Why	Direct command words used for multiple-choice questions.

Appendix 6: Suggested practical investigations

The following suggestions are *additional* practical investigations that exemplify the scientific process. They can be used to supplement students' understanding of human biology in addition to the practical investigations found within the main body of the content.

- Investigate cells from different tissues using a light microscope and observe electron micrographs of cells as listed in 1.1.
- Investigate the stages of mitosis using microscopy.
- Investigate the nutrient content of food limited to starch, protein, glucose and lipids.
- Investigate diffusion and osmosis using living and non-living systems.
- Investigate the speed of a nerve impulse.
- Investigate the effect of light intensity on the eye.
- Investigate the effect of antibiotics on bacteria.

Safety is an overriding requirement for all practical work. Centres are responsible for ensuring that whenever their students complete practical work appropriate safety procedures are followed.

Appendix 7: Glossary

Term	Definition
Assessment objectives	The requirements that students need to meet to succeed in the qualification. Each assessment objective has a unique focus that is then targeted in examinations or coursework. Assessment objectives may be assessed individually or in combination.
External assessment	An examination that is held at the same time and place in a global region.
JCQ	Joint Council for Qualifications. This is a group of UK exam boards that develop policy related to the administration of examinations.
Linear	Qualifications that are linear have all assessments at the end of a course of study. It is not possible to take one assessment earlier in the course of study.

For information about Edexcel, BTEC or LCCI qualifications
visit qualifications.pearson.com

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