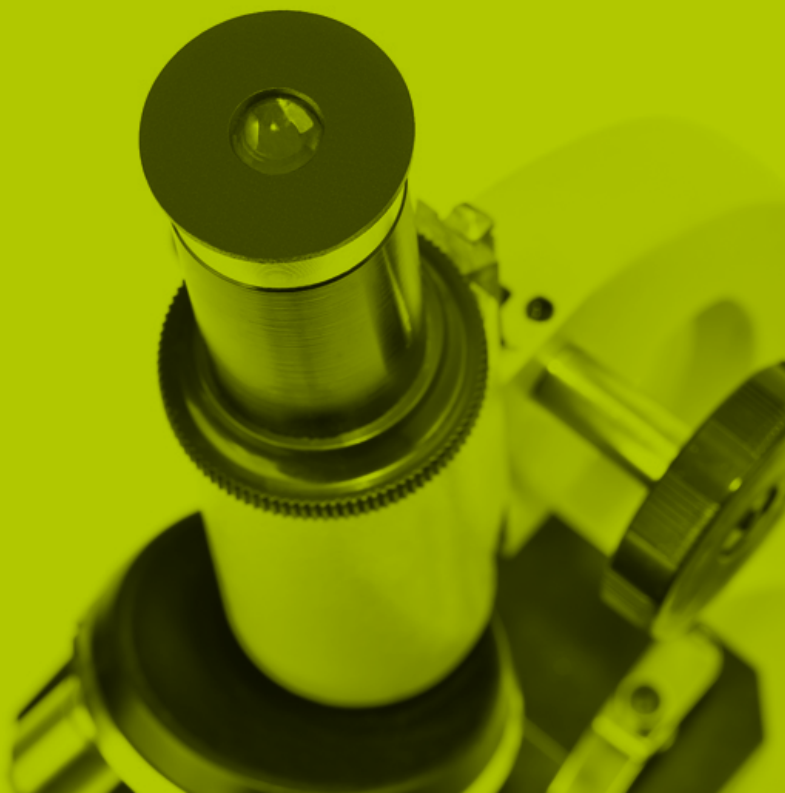
ENTRY LEVEL

WJEC ENTRY LEVEL Certificate in SCIENCE

REGULATED BY OFQUAL
DESIGNATED BY QUALIFICATIONS WALES

SPECIFICATION

Teaching from 2016
For award from 2018



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SUMMARY OF ASSESSMENT

Unit 1: Entry Level Science 1 Written examination: 1 hour 25% of qualification	60 marks
A mix of short answer questions, structured questions, and data response questions with some set in a practical context.	
Unit 2: Entry Level Science 2 End of unit tests: 4 × 0.5 hours 60% of qualification	120 marks
A mix of short answer questions, structured questions, and data response questions with some set in a practical context. An internally assessed unit.	
Unit 3: Entry Level Science 3 Practical assessment: 2 × 2 hours 15% of qualification	40 marks
An internally assessed, practical assessment.	

This linear qualification will be available in the summer series each year. It will be awarded for the first time in summer 2018.

Ofqual Qualification Number (listed on The Register): 601/8295/7

Qualifications Wales Designation Number (listed on QiW): C00/0792/0

ENTRY LEVEL CERTIFICATE IN SCIENCE

1 INTRODUCTION

1.1 Aims and objectives

The WJEC Entry Level Certificate in Science is designed for candidates who have not reached Level 3 of the National Curriculum at the end of Key Stage 3 and for whom GCSE and equivalent vocational qualifications are not deemed appropriate. The qualification utilises a context led approach to science learning and assessment. It provides learners with a broad, coherent, practical, satisfying and worthwhile course of study.

This specification has been written to meet, where appropriate, the Programme of Study requirements for National Curriculum Science at Key Stage 4. However, it recognises that the National Curriculum allows material to be selected from earlier Key Stages to enable individual candidates to progress and demonstrate achievement. Where such material is used, it is presented in contexts suitable for older candidates. The course will prepare candidates for further studies in science, e.g. GCSE Applied Science (Single Award), or science related vocational courses.

This WJEC Entry Level Certificate in Science specification will enable learners to develop:

- knowledge and understanding of key areas of science and its application
- interest in and enthusiasm for science
- competence and confidence in a variety of practical, and problem solving skills
- understanding of the scientific process
- scientific enquiry and modelling skills and understanding in laboratory, and work-related contexts
- understanding of the relationships between data, evidence and explanations and their ability to evaluate scientific methods, evidence and conclusions
- understanding of how society makes decisions about scientific issues
- communication, mathematical and technological skills in scientific contexts

This specification is intended to promote a variety of styles of teaching and learning so that the course is enjoyable for all participants. Learners will be introduced to a wide range of scientific principles set in meaningful contexts enabling them to enjoy a positive learning experience. Practical work is an intrinsic part of science. It is imperative that practical skills are developed throughout this course and that an investigatory approach is promoted.

1.2 Prior learning and progression

There are no previous learning requirements for this specification. Any requirements set for entry to a course based on this specification are at the centre's discretion.

This specification builds on subject content which is typically taught at Key Stage 3 and provides a suitable foundation for the study of GCSE, for example Applied Science (Single Award) or Applied Science (Double Award). In addition, the specification provides a coherent, satisfying and worthwhile course of study for learners who do not progress to further study in this subject.

1.3 Equality and fair access

This specification may be followed by any learner, irrespective of gender, ethnic, religious or cultural background. It has been designed to avoid, where possible, features that could, without justification, make it more difficult for a learner to achieve because they have a particular protected characteristic.

The protected characteristics under the Equality Act 2010 are age, disability, gender reassignment, pregnancy and maternity, race, religion or belief, sex and sexual orientation.

The specification has been discussed with groups who represent the interests of a diverse range of learners, and the specification will be kept under review.

Reasonable adjustments are made for certain learners in order to enable them to access the assessments (e.g. candidates are allowed access to a Sign Language Interpreter, using British Sign Language). Information on reasonable adjustments is found in the following document from the Joint Council for Qualifications (JCQ): *Access Arrangements and Reasonable Adjustments: General and Vocational Qualifications.*

This document is available on the JCQ website (www.jcq.org.uk). As a consequence of provision for reasonable adjustments, very few learners will have a complete barrier to any part of the assessment.

1.4 Welsh perspective

In following this specification, learners in Wales should consider a Welsh perspective if the opportunity arises naturally from the subject matter and if its inclusion would enrich learners' understanding of the world around them as citizens of Wales as well as the UK, Europe and the world.

2 SUBJECT CONTENT

This section outlines the knowledge, understanding and skills to be developed by learners studying Entry Level Certificate in Science.

Entry Level Certificate in Science provides a context led framework for developing learners' knowledge, understanding and skills. These contexts are intended to enable learners to make meaningful connections between what they learn and how science is used to solve 'real world' problems. Learners should therefore be prepared to apply the knowledge, understanding and skills specified in a range of contexts which include the generation/use of electricity, our planet, obtaining clean water, producing useful compounds, protecting our environment.

Practical work is an intrinsic part of this specification. It is vitally important in developing a conceptual understanding of many topics and it enhances the experience and enjoyment of science. The practical skills developed are also fundamentally important to learners going on to further study in science and related subjects, and are transferable to many careers.The completion of this practical work will develop the practical skills listed in Appendix A.

Appendix B lists the mathematical requirements.

All content in the specification should be introduced in such a way that it develops learners' ability to:

- understand scientific concepts related to the material, physical and living world
- understand the nature of science and its application to the environment, the individual and society
- understand processes and methods of science, through different types of scientific enquiries that help them to answer scientific questions about the world around them
- apply observational, practical, enquiry and problem-solving skills, both in the laboratory, in the field and in other learning environments
- apply their skills in communication and mathematics in scientific contexts
- evaluate claims based on science
- appreciate the inter-disciplinary approach to science needed to solve problems

The subject content is made up of the following topics:

1 Modern living and energy

1.1 Energy concepts and use

1.2 Generating electricity

1.3 Building electrical circuits

2 Obtaining resources

2.1 Obtaining clean water

2.2 Our planet

2.3 Producing useful compounds in the laboratory

2.4 Controlling chemical reactions

3 Our planet

3.1 Our place in the universe

3.2 World of life

3.3 Protecting our environment

4 Health, fitness and sport

4.1 Factors affecting human health

4.2 Fighting disease

4.3 Exercise and fitness in humans

1 Modern living and energy

1.1 Energy concepts and use

Overview

Electricity is essential to modern-day living. How can we use energy efficiently either when we generate electricity or when we use it in our homes? It is important to understand energy transfer if we are to generate electricity efficiently or use energy in the home. Learners can apply their knowledge in a number of fields including electricity generation and sustainable development.

This topic introduces some key scientific concepts that will need to be applied to generating electricity (1.2).

Working Scientifically

This topic enables learners to explain everyday applications of science; evaluate associated personal, social, economic and environmental implications; make decisions based on evaluation of evidence; plan experiments to make observations and test hypotheses; interpret observations and other data, including identifying patterns and trends, making inferences and drawing conclusions. Learners will also learn to use scientific vocabulary, understand scientific quantities and interconvert units.

Learners should be able to demonstrate and apply their knowledge and understanding of:

(a) how temperature differences lead to the transfer of energy

(b) the kinetic theory of the different states of matter where solids, liquids and gases have different amounts of energy

(c) energy transfer by conduction, convection and radiation

(d) useful energy transfers and wasted energy

(e) the energy banding (A-G) and the power ratings of domestic electrical appliances to investigate the cost of using them

(f) how energy loss from houses can be restricted e.g. loft insulation and double glazing, cavity wall insulation and draught excluders; the cost effectiveness of different methods of reducing energy loss from the home; the economic and environmental issues surrounding controlling energy loss

1.2 Generating electricity

Overview

The methods of electricity generation are widely debated. How can we generate electricity? How do different methods compare with respect to their costs, effectiveness and potential impacts on the environment? How do we get electricity to our homes from where it is produced? This topic explores different ways of generating electricity and compares them for cost efficiency, reliability and environmental impact. Learners will also explore how electricity can be transferred from power stations to where it is used. Learners can apply their knowledge in a number of fields including electricity generation and sustainable development.

This topic also requires learners to apply concepts learnt in 1.1 to generating electricity.

Working Scientifically

Consideration of methods of energy generation allows learners to explain everyday and technological applications of science; evaluate personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments. This topic also enables learners to appreciate the power and limitations of science and consider any ethical issues which may arise.

Learners should be able to demonstrate and apply their knowledge and understanding of:

(a) the advantages and disadvantages of renewable and non-renewable energy technologies (e.g. hydro-electrical, wind power, wave power, tidal power, waste, crops, solar, wood, coal, crude oil, natural gas and nuclear) as a means of generating electricity on a national scale using secondary information

(b) the cost-effectiveness of instaling domestic solar and wind energy equipment, including fuel-cost savings and payback time by using data

(c) sustainability, carbon footprint, cost, reliability, environmental impact to compare different methods of power generation

(d) the need for the National Grid as an electricity distribution system including monitoring power use and responding to changing demand

(e) domestic electricity meters that measure the energy used

1.3 Building electrical circuits

Overview

A large number of electrical devices are now used in our homes, at work, or for leisure. Electricity is used in every walk of life. What is an electric circuit? Does it matter how components are arranged in an electric circuit? What size fuse should be used in a circuit? In this topic learners will explore simple electric circuits and understand how the construction of a circuit affects the current and voltage across components. Learners can apply their knowledge in a number of fields including electrical engineering, electronics and communications.

Working Scientifically

The study of electrical circuits enables learners to use scientific vocabulary, terminology and definitions; recognise the importance of scientific quantities and understand how they are determined.

Learners should be able to demonstrate and apply their knowledge and understanding of:

(a) the symbols of components (e.g. cell, switch, voltmeter, ammeter, resistor, diode, lamp, fuse) used in electrical circuits

(b) series circuits in which the current is the same throughout a circuit and voltages add up to the supply voltage; parallel circuits in which the voltage is the same across each branch and the current in each branch adds up to the current in the supply

(c) the energy changes that take place in a circuit

(d) voltmeters and ammeters to measure the voltage across and current through electrical components in electrical circuits

2 Obtaining resources

2.1 Obtaining clean water

Overview

Water is a fundamental need of every living thing. What is in water? How can we obtain clean water for household use? How can we reduce the environmental impact of obtaining water? In this topic, learners are introduced to the composition of water and the need to treat water before it can be used by the public. Learners can apply their knowledge in a number of fields including the chemical industry and environmental monitoring.

Working Scientifically

Obtaining clean water allows learners to explain everyday and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on evaluation of evidence and arguments.

Learners should be able to demonstrate and apply their knowledge and understanding of:

(a) elements as substances that cannot be broken down by chemical means and as the building blocks of all substances and which can be represented by a symbol

(b) the differences between elements and compounds in terms of elements being composed of one type of atom while compounds are made of two or more different types of atom that are chemically joined

(c) the need for a sustainable water supply, to include reducing our water consumption, reducing the environmental impacts of abstracting, distributing and treating water

(d) desalination of sea water to supply drinking water including the sustainability of this process on a large scale

(e) the separation of water and other miscible liquids by distillation

2.2 Our planet

Overview

Naturally-occurring materials such as metals, rocks and minerals can be made into more useful products by physical or chemical change. Where do we get the raw products to make these useful products from? How did they get there? How do we extract and process them? How long will supplies last? We need a steady supply of essential raw materials (e.g. crude oil) to produce useful substances (e.g. plastics) but what is the impact on the environment and society of obtaining them?

This topic helps learners understand how raw materials such as metal ores, crude oil and gases such as oxygen are obtained from the Earth's crust or atmosphere and processed. They will also consider the benefits and environmental impacts of obtaining these materials. Learners can apply their knowledge in a number of fields including the chemical industry and engineering.

Working Scientifically

The study of our planet allows learners to understand how scientific methods and theories develop over time; explain everyday and technological applications of science; evaluate associated personal, social, economic and environmental implications; make decisions based on evaluation of evidence and arguments; evaluate risks both in practical science and in the wider societal context, including the perception of risk in relation to data and consequences.

Learners should be able to demonstrate and apply their knowledge and understanding of:

(a) the large scale structure of the Earth in terms of solid iron core, molten iron outer core, mantle and crust

(b) the present composition of the atmosphere; how the composition of the atmosphere has changed over geological time

(c) ores as rocks that contain metals or compounds of metals

(d) methods to obtain raw materials from the Earth’s crust or atmosphere, including metal ores via surface and subsurface mining, shale gas via fracking, crude oil via drilling, salt via solution mining or deep-shaft mining

(e) the need to process most raw materials to produce useful materials, including separation of components and chemical transformation (e.g. crude oil being separated into useful fractions)

(f) the environmental, social and economic impacts of obtaining and processing raw materials e.g. the impacts of mining including spoil heaps; drilling for oil including oil spills; fracking; impact of using crops to produce raw materials for fuels/ producing bioplastics on food production; the effect on the world’s oceans and marine life of waste plastics in the environment

2.3 Producing useful compounds in the laboratory

Overview

The production of chemicals has made a big impact on the way we live. How can we produce chemical compounds in the laboratory? Is there more than one way of producing a compound? If so, which method is the best? This unit introduces the basic chemistry and skills needed to answer questions such as these to allow learners to prepare compounds in the laboratory. Learners will prepare salts and will use their understanding of laboratory procedures to evaluate the suitability of a method. Learners can apply their knowledge in a number of fields including the chemical and pharmaceutical industries.

Working Scientifically

Production of useful compounds allow learners to plan experiments or devise procedures to make observations or produce a substance; apply knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment; carry out experiments appropriately having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations; evaluate methods and suggest possible improvements and further investigations; use scientific vocabulary, terminology and definitions.

Learners should be able to demonstrate and apply their knowledge and understanding of:

(a) reactions of acids and bases to prepare salts

(b) uses of neutralisation reactions

(c) laboratory techniques to make useful salts, including insoluble salts (e.g. copper carbonate) and soluble salts (e.g. copper sulfate, zinc sulfate, potassium nitrate, ammonium nitrate)

(d) laboratory procedures to evaluate the suitability of different methods of compound preparation, including the hazards in preparation and skills required

2.4 Controlling chemical reactions

Overview

The chemical industry provides many of the chemicals that people need for modern life. The chemical industry today is developing new processes for manufacturing these chemicals more efficiently and with less impact on the environment. How can we control a chemical process so that it remains safe and yet produces what we want in a reasonable time (and for a reasonable cost)? This unit explores how the rate of reaction depends upon the conditions of a chemical reaction. Learners can apply their learning in pharmaceutical and chemical fields.

Working Scientifically

Consideration of how chemical reactions are controlled, allows learners to appreciate the power and limitations of science and consider any ethical issues which may arise; explain the everyday and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments.

Learners should be able to demonstrate and apply their knowledge and understanding of:

(a) chemical reactions that involve transformation of one set of chemical compounds into another; that in a chemical reaction, atoms are re-arranged to make new products and no atoms are lost or gained

(b) how the energy stored in a chemical system changes when a reaction occurs resulting in an endothermic reaction (process causing the temperature of the surroundings to decrease) or exothermic reaction (process causing the temperature of surroundings to increase)

(c) how concentration, temperature, particle size and surface area affect the reaction rate (no knowledge of collisions or activation energy is required)

(d) how to carry out experiments to study how factors affect the rate of reaction

3 Our planet

3.1 Our place in the universe

Overview

Planet Earth is just one body that orbits a star that we know as the Sun. The Sun is just one of a very large number of stars that make up our galaxy. There are estimated to be between 100 and 400 billion stars in our own galaxy. These stars are very far away and can only be examined by powerful telescopes using the electromagnetic radiation emitted from them. Although space probes have landed on the surfaces of planets in our own solar system much of the information comes from examining electromagnetic radiation reflected from the planet's surface.

What is the electromagnetic spectrum and how does it help us learn about objects far from Earth and what they are made of? How can we interpret data to help us understand the universe? In this section learners will explore the universe. Learners can apply their knowledge in a number of fields including communications and space exploration.

Working Scientifically

The consideration of our place in the universe allows learners to understand how scientific methods and theories develop over time; explain everyday and technological applications of science; evaluate associated personal, social, economic and environmental implications; make decisions based on evaluation of evidence and arguments.

Learners should be able to demonstrate and apply their knowledge and understanding of:

(a) the main parts of the electromagnetic spectrum including gamma rays, X-rays, ultraviolet, visible light, infra-red, microwaves and radio waves; the arrangement of the electromagnetic spectrum in terms of wavelength and frequency.

(b) how electromagnetic waves are used to study the solar system to include:

- X-ray images of the Sun
- ultra violet images of the Sun, galaxies and the Earth
- visible light images of the Sun, planets, moons and galaxies
- infra-red images of the Sun, the Earth and the Milky Way
- radio wave images of stars

(c) the relative scale of the universe, galaxies, and solar system in terms of light years

(d) the structure of our solar system to include the Sun, planets, main moons, and the asteroid belt

3.2 World of life

Overview

Ecology is the study of interactions of organisms and their environment. How can we classify organisms? How are living things suited to their environment? Why do some species survive whereas others become extinct? How have organisms changed over time? How do energy and nutrients pass through food chains?

Learners should be able to apply the concepts in this section to appreciate the variety of life on Earth, consider how ecosystems are in balance and how living organisms are dependent on their environment and each other for survival. Learners can apply their knowledge in a number of fields including ecology and environmental analysis.

Working Scientifically

The study of evolution allows an understanding of how theories develop over time; appreciate the power and limitation of science and consider any ethical issues which may arise, and make decisions based on evaluation of evidence and arguments. This topic also enables learners to make predictions and develop scientific explanations and understanding of familiar and unfamiliar facts; make decisions based on the evaluation of evidence and arguments and evaluate risks in a wider societal context.

Learners should be able to demonstrate and apply their knowledge and understanding of:

(a) structure of animal and plant cells, and specialisation that results from being multicellular; function of the following parts: cell membrane, cytoplasm, nucleus, cell wall, vacuole, chloroplast
(b) levels of organisation: aggregation of cells into tissues, and tissues into organs
(c) how organisms (plants and animals) are adapted to their environment and how this allows them to compete for resources and mates; the use of data (numbers and distribution of organism, characteristics of organism) to investigate the success of an organism in an environment
(d) classification of organisms (plants, animals, microorganisms) that have similar features in a logical way
(e) different groups of organisms being distinguished according to characteristic features
(f) the variation in individuals of the same species having environmental or genetic causes
(g) how individuals with characteristics adapted to their environment are more likely to survive and breed successfully
(h) food chains and food webs to show the transfer of useful energy between organisms; the terms producer, primary consumer, secondary consumer, tertiary consumer, herbivore, carnivore and omnivore to describe the organisms in a food web
(i) interdependency of organisms; how change affects species in a food web
(j) radiation from the Sun being the source of energy for most ecosystems/communities of living organisms

3.3 Protecting our environment

Overview

The environment and biodiversity is changing due to human impact. How do our unwanted products affect the world around us? How can we detect what is in our environment? How can we treat our waste products to improve safety? What methods can be used to maintain biodiversity? Learners will consider how the way we live affects the world around us. They will also gain an understanding of how we can monitor our environment. Learners can apply their knowledge in a number of fields including environmental monitoring and biotechnology.

Working Scientifically

The issues surrounding pollution of the environment enable learners to explain everyday and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments. Learners will also evaluate risks in both practical science and in the wider societal context; including perception of risk in relation to data and consequences.

Learners should be able to demonstrate and apply their knowledge and understanding of:

(a) how heavy metals from industrial waste and mining enter the food chain; how pesticides can enter the food chain; how heavy metals and pesticides may have harmful effects

(b) the impact of building developments, mining and agriculture on habitat and biodiversity

(c) environmental monitoring using living indicators (e.g. lichens to monitor air pollution, invertebrate animals as water pollution indicators) and non-living indicators (e.g. pH, metals, oxygen levels in streams to monitor water pollution)

(d) maintenance of biodiversity using captive breeding programmes, seed banks and protected areas

4 Health Fitness and Sport

4.1 Factors affecting human health

Overview

Human health is affected by a number of factors. Here you will look at how inheritance, lifestyle and the environment affect human health. What are genes and how do they affect the way that organisms develop? How can we use our knowledge of genes to prevent disease? How do our lifestyle choices affect our health? Learners can apply their knowledge in a number of fields including sport, nutrition and medicine.

Working Scientifically

This section enables learners to appreciate the power and limitations of science and consider any ethical issues which may arise; explain everyday applications of science, evaluate associated personal, social, economic and environmental implications, and make decisions based on the evaluation of evidence and arguments.

Learners should be able to demonstrate and apply their knowledge and understanding of:

(a) chromosomes that contain DNA molecules which determine inherited characteristics and are found in pairs; genes as sections of DNA molecules that determine inherited characteristics and are found in pairs since chromosomes are normally found in pairs

(b) new genes that result from changes (mutations) in existing genes; mutations that may be harmless, beneficial or harmful and may be passed on from parents to offspring

(c) some diseases that are caused by alterations in our genes / chromosomes

(d) the short term and long term impact of excessive alcohol consumption on the body and society; addiction as a consequence of sustained alcohol consumption

(e) the importance of a healthy diet

(f) the terms Guideline Daily Amount (GDA) and Recommended Daily Allowance (RDA) and their relevance to a controlled diet; food labelling, including food traffic lights, use by dates, quantities and energy values of nutrients and other components of food, including salt and sugar

(g) the adverse health risks associated with obesity; the implications of obesity to society (impact on NHS and resources)

(h) the effects of smoking on the body and society

(i) the role of insulin as a hormone that controls blood glucose levels (no knowledge of glucose homeostasis is required); diabetes as a common disease in which a person has a high blood glucose; how diabetes can be controlled

4.2 Fighting disease

Overview

Treatment of infection and disease is extremely important, and as our life expectancy increases, new diseases will arise. Why do you catch some diseases but not others? Why are we encouraged to have vaccinations? Why should we always finish a course of antibiotics? How do our bodies resist infection? How do drug companies make sure a new drug is as safe as possible? Learners can apply their knowledge to the health, medicine and the pharmaceutical industry.

Working Scientifically

In consideration of vaccination and antibiotic resistance, learners will understand how scientific theories develop over time. They can appreciate the power and limitations of science and consider any ethical issues which may arise. In considering whether to vaccinate or not, learners can evaluate risks in a wider societal context.

Learners should be able to demonstrate and apply their knowledge and understanding of:

(a) microorganisms, to include some microorganisms that are harmless and perform vital functions, and some microorganisms, called pathogens, that cause diseases

(b) the barrier against microorganisms formed by intact skin; defence of the body by: blood clots to seal wounds; white cells in the blood that ingest microorganisms and produce antibodies and antitoxins

(c) protection of humans from infectious disease by vaccination (no details of acquired immunity required)

(d) antibiotics, including penicillin, that were originally medicines produced by living organisms, such as fungi; treatment of bacterial disease by antibiotics that kill the infecting bacteria or prevent their growth

(e) resistance resulting from overuse of antibiotics, such as MRSA; effective control measures for MRSA

(f) drug treatments that have positive effects and possible side effects on the patient (e.g. aspirin as a common treatment of patients suffering cardiovascular disease)

(g) the stringent testing that new drugs undergo before they can be released for general use; animal testing and clinical trials; ethical decisions with differences of opinion on what is acceptable

4.3 Exercise and fitness in humans

Overview

It is widely recognised that a heathy lifestyle should involve an appreciable amount of exercise each day. How do our bodies control movement? How does the cardiovascular system allow delivery of substances needed by our body? What are the effects of exercise on heart rate and fitness? Learners can apply their learning in medical and fitness fields.

Working Scientifically

The consideration of exercise and fitness in humans allows learners to explain the everyday and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments.

Learners should be able to demonstrate and apply their knowledge and understanding of:

(a) structure of the nervous system in humans; the role of the nervous system in reflex and voluntary actions (no detail of the reflex arc is required)

(b) structure and function of the human cardiovascular system to include the heart, ventricles, valves, atria, veins, arteries and double circulatory system (names of valves not required)

(c) composition of blood and functions of red blood cells, white blood cells, plasma and platelets

(d) measurements to monitor pulse rate, breathing rate and recovery time

(e) physiological effects of exercise on breathing. Short term effects: breathing rate increases to provide the oxygen and remove carbon dioxide. Long term effects: the body becomes more efficient at transporting oxygen

(f) physiological effects of exercise on heart rate and recovery time (Short term effects: heart rate increases, cardiac output increases. Long term effects: heart muscle strengthened, heart muscle becomes more efficient)

2.1 Unit 1

Written Examination: 1 hour

25% of qualification

This unit is assessed by an external examination available in the summer series.

The examination will assess the knowledge and understanding of every topic (1, 2, 3, and 4), as well as skills and processes set in the context of each topic. Working scientifically skills (Appendix A) and mathematical skills (Appendix B) will also be assessed as part of the external examination.

2.2 Unit 2

End of topic tests
60% of qualification

Candidates must take end of topic tests set by WJEC on completion of every topic (1, 2, 3 and 4)

End of topic tests will assess predominantly knowledge and understanding of the unit although skills and processes set in the context of the unit may also be tested.

Each test must be taken under a high level of control i.e. learners must work individually under teacher supervision.

End of topic tests will change on an annual basis. They will be marked by the centre and moderated by WJEC.

The time allowed for each test must be 30 minutes. End of topic tests may be read out to candidates. All candidates' end of topic tests must be retained until the end of the course. A sample of candidates' work containing all tests will be required for moderation.

2.3 Unit 3

Practical Assessment
15% of qualification

This assessment gives learners the opportunity to demonstrate their ability to work scientifically. This will include experimental skills and strategies and skills in analysis and evaluation.

Each year, WJEC will provide three tasks based on the content of Entry Level Certificate in Science. Candidates are required to complete **two** tasks so centres can select which two they wish to use with candidates.

The tasks will be internally assessed by centres.
A sample of completed assessments will be required for moderation.

Each task comprises two sections.

Section A – Obtaining results (10 marks)
Learners will be permitted to work in groups of no more than three, to obtain results of a given experimental method. This will be carried out under a limited level of control i.e. learners may work with others to obtain results but they must provide their own responses to the questions set. Teacher assistance should not normally be required, but may be given if equipment failure occurs. Section A should be completed in one session of 60 minutes duration.

Section B – Analysing and evaluating results (10 marks)
Learners will be assessed on their ability to analyse and evaluate the data obtained in section A. They will require access to their section A assessment in order to complete this. Section B will be carried out under a high level of control i.e. learners must work individually. This section is to be completed with no teacher feedback or assistance allowed and under formal supervision in one session of 60 minutes in duration.

3 ASSESSMENT

3.1 Assessment objectives and weightings

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

AO1
Demonstrate knowledge and understanding of scientific ideas, processes, techniques and procedures

AO2
Apply knowledge and understanding of scientific ideas, processes, techniques and procedures

AO3
Analyse, interpret and evaluate scientific information, ideas and evidence, including in relation to issues, to:

- make judgements and reach conclusions;
- develop and refine practical design and procedures

The table below shows the weighting of each assessment objective for the qualification.

AO1	AO2	AO3
30%	60%	10%

4 TECHNICAL INFORMATION

4.1 Making entries

This is a linear qualification.

Assessment opportunities will be available in the summer assessment period each year, until the end of the life of the specification.

All units will be available in 2018 (and each year thereafter). The qualification will be awarded for the first time in summer 2018.

A candidate may retake the whole qualification more than once.

The entry codes appear below.

Qualification title	Entry codes	
	English-medium	Welsh-medium
WJEC Entry Level Certificate in Science	6430QC	6430CC

The current edition of our *Entry Procedures and Coding Information* gives up-to-date entry procedures.

4.2 Moderation Procedures

Internal moderation of Unit 2 and Unit 3.

Centres must ensure that careful moderation is carried out where more than one teacher is responsible for the marking of Unit 2 and Unit 3 assessments. This is necessary to ensure uniformity of standards within a centre.

External moderation of Unit 2 and Unit 3.

External moderation is the process whereby the marks awarded by the centre are checked for accuracy and consistency across centres. This involves a moderator appointed by WJEC checking a sample of the work from a centre. An internal assessment manual is available from WJEC each year which contains information about selecting a sample for external moderation and submission dates.

Centres should also send to their appointed moderator the following documents:

- any relevant administration forms
- copies of any detailed interpretation of the mark schemes used, especially if work is contextualised
- any further information which may help the moderator when interpreting the work or marking
- signed authentication
- details of internal moderation (if applicable).

4.3 Grading, awarding and reporting

Awarding will be conducted according to the Entry Level Code of Practice.

The awards will be graded Entry 3, Entry 2 and Entry 1 corresponding to achievements broadly comparable with levels 3, 2 and 1 of the National Curriculum.

To obtain Entry 1, the candidate should have followed the programme of study and achieved approximately 35% of the available marks.

To obtain Entry 2, the candidate should have followed the programme of study and achieved approximately 65% of the available marks.

To obtain Entry 3, the candidate should have followed the programme of study and achieved approximately 80% of the available marks.

The percentages above are intended for guidance only and are not rigidly fixed as the degree of difficulty of tasks may vary. This variation will be taken into account at the moderation and awarding stages.

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APPENDIX A

Working Scientifically

1. Development of scientific thinking

- understand how scientific methods and theories develop over time
- use a variety of models to solve problems, make predictions and to develop scientific explanations and understanding of familiar and unfamiliar facts
- appreciate the power and limitations of science and consider any ethical issues which may arise
- explain every day and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments
- evaluate risks both in practical science and the wider societal context.

2. Experimental skills and strategies

- use scientific theories and explanations to develop hypotheses
- plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena
- apply a knowledge of a range of techniques, instruments, apparatus
- carry out experiments appropriately having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations
- make and record observations and measurements using a range of apparatus and methods
- evaluate methods and suggest possible improvements and further investigations.

3. Analysis and evaluation

- Apply the cycle of collecting, presenting and analysing data, including:
  - presenting observations and other data using appropriate methods
  - translating data from one form to another
  - carrying out and represent mathematical analysis
  - representing distributions of results
  - interpreting observations and other data (presented in verbal, diagrammatic, graphical, symbolic or numerical form), including identifying patterns and trends, making inferences and drawing conclusions
  - presenting reasoned explanations including relating data to hypotheses
  - being objective, evaluating data in terms of accuracy, repeatability and reproducibility
  - communicating the scientific rationale for investigations, methods used, findings and reasoned conclusions through paper-based and electronic reports and presentations using verbal, diagrammatic, graphical, numerical and symbolic forms.

4. Scientific vocabulary, quantities, units, symbols and nomenclature

- use scientific vocabulary, terminology and definitions
- recognise the importance of scientific quantities and understand how they are determined
- use SI units (e.g. kg, g; km, m, mm; kJ, J) and IUPAC chemical nomenclature unless inappropriate
- use prefixes for orders of magnitude (e.g. kilo, centi, milli)
- interconvert units

APPENDIX B

Mathematical skills

This table shows the mathematical skills which can be assessed.

	Skill
1	***Arithmetic and numerical computation***
	Recognise and use expressions in decimal form
	Use ratios, fractions and percentages
2	***Handling data***
	Find arithmetic means
	Construct and interpret tables and diagrams
	Make order of magnitude calculations
3	***Graphs***
	Translate information between graphical and numeric form
	Plot two variables from experimental or other data