



Syllabus

Cambridge O Level

Agriculture 5038

Use this syllabus for exams in 2023.

Exams are available in the November series.



Why choose Cambridge International?

Cambridge International prepares school students for life, helping them develop an informed curiosity and a lasting passion for learning. We are part of the University of Cambridge.

Our Cambridge Pathway gives students a clear path for educational success from age 5 to 19. Schools can shape the curriculum around how they want students to learn – with a wide range of subjects and flexible ways to offer them. It helps students discover new abilities and a wider world, and gives them the skills they need for life, so they can achieve at school, university and work.

Our programmes and qualifications set the global standard for international education. They are created by subject experts, rooted in academic rigour and reflect the latest educational research. They provide a strong platform for learners to progress from one stage to the next, and are well supported by teaching and learning resources.

Our mission is to provide educational benefit through provision of international programmes and qualifications for school education and to be the world leader in this field. Together with schools, we develop Cambridge learners who are confident, responsible, reflective, innovative and engaged – equipped for success in the modern world.

Every year, nearly a million Cambridge students from 10 000 schools in 160 countries prepare for their future with the Cambridge Pathway.

'We think the Cambridge curriculum is superb preparation for university.'

Christoph Guttentag, Dean of Undergraduate Admissions, Duke University, USA



Quality management

Cambridge International is committed to providing exceptional quality. In line with this commitment, our quality management system for the provision of international qualifications and education programmes for students aged 5 to 19 is independently certified as meeting the internationally recognised standard, ISO 9001:2015. Learn more at www.cambridgeinternational.org/ISO9001

Copyright © UCLES September 2020

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

UCLES retains the copyright on all its publications. Registered centres are permitted to copy material from this booklet for their own internal use. However, we cannot give permission to centres to photocopy any material that is acknowledged to a third party even for internal use within a centre.

Contents

1 Why choose this syllabus?	2
2 Syllabus overview	5
Aims	5
Content overview	6
Assessment overview	7
Assessment objectives	8
3 Subject content	10
4 Details of the assessment	18
Paper 1 Theory	18
Component 2 Practical Coursework	18
Practical Exercises	20
Practical Investigation	24
5 Appendix	31
Physical and chemical concepts and processes	31
Mathematical requirements	31
Terminology, units, symbols and presentation of data for agriculture	31
Glossary of command terms used in science papers	34
6 What else you need to know	36
Before you start	36
Making entries	37
After the exam	38
How students and teachers can use the grades	38
Grade descriptions	38
Changes to this syllabus for 2023	39

Important: Changes to this syllabus

For information about changes to this syllabus for 2023, go to page 39.

The latest syllabus is version 1, published September 2020. There are no significant changes which affect teaching.



1 Why choose this syllabus?

Key benefits

Cambridge O Level is typically for 14 to 16 year olds and is an internationally recognised qualification. It has been designed especially for an international market and is sensitive to the needs of different countries. Cambridge O Level is designed for learners whose first language may not be English, and this is acknowledged throughout the examination process.

Our programmes balance a thorough knowledge and understanding of a subject and help to develop the skills learners need for their next steps in education or employment.

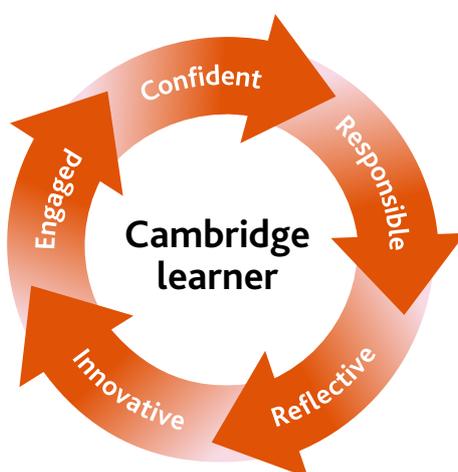
By studying **Cambridge O Level Agriculture** as an applied science, candidates learn basic agricultural principles and skills through extensive practical experience.

The syllabus develops candidates' ability to apply a scientific approach to the study of topics such as:

- crop and livestock husbandry
- farm structure and machinery
- agricultural economics

As a result, students gain a positive attitude towards farming and rural development, and appreciate the ways in which improved agricultural practice can be used to alleviate the problems of famine and malnutrition.

Our approach in Cambridge O Level Agriculture encourages learners to be:



'Cambridge O Level has helped me develop thinking and analytical skills which will go a long way in helping me with advanced studies.'

Kamal Khan Virk, former student at Beaconhouse Garden Town Secondary School, Pakistan, who went on to study Actuarial Science at the London School of Economics

International recognition and acceptance

Our expertise in curriculum, teaching and learning, and assessment is the basis for the recognition of our programmes and qualifications around the world. The combination of knowledge and skills in Cambridge O Level Agriculture gives learners a solid foundation for further study. Candidates who achieve grades A* to C are well prepared to follow a wide range of courses including Cambridge International AS and A Levels.

Cambridge O Levels are accepted and valued by leading universities and employers around the world as evidence of academic achievement. Many universities require a combination of Cambridge International AS & A Levels and Cambridge O Levels or equivalent to meet their entry requirements.

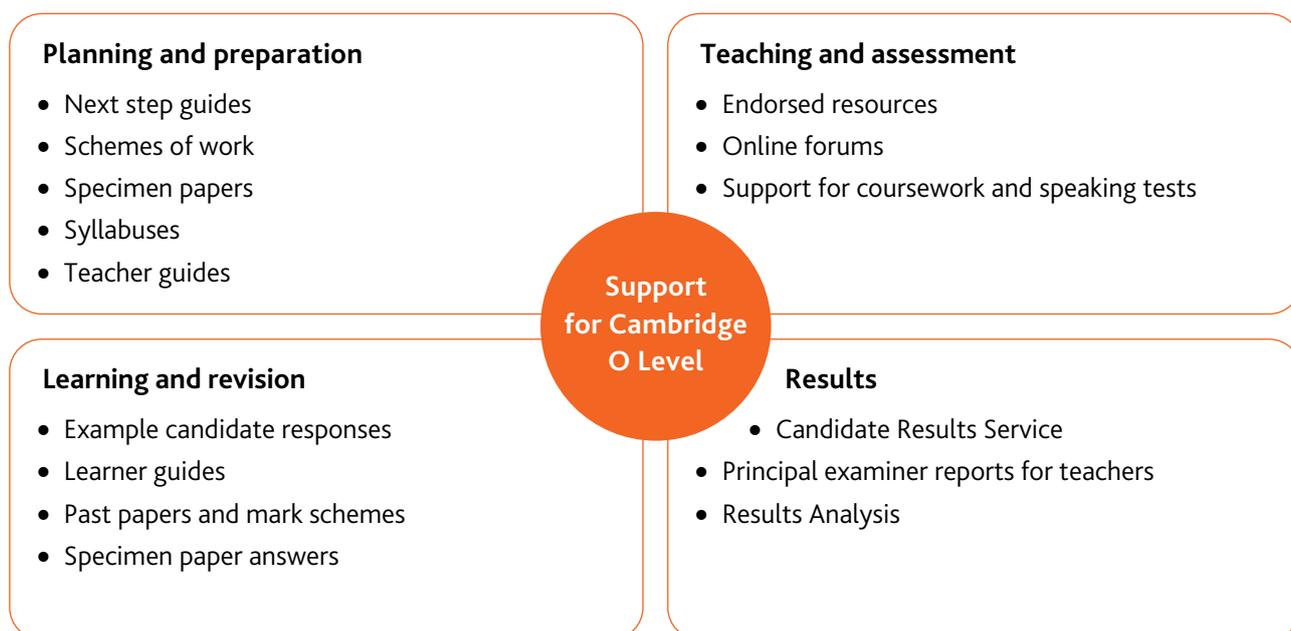
Learn more at www.cambridgeinternational.org/recognition

Supporting teachers

We provide a wide range of resources, detailed guidance and innovative training and professional development so that you can give your students the best possible preparation for Cambridge O Level. To find out which resources are available for each syllabus go to our School Support Hub.

The School Support Hub is our secure online site for Cambridge teachers where you can find the resources you need to deliver our programmes. You can also keep up to date with your subject and the global Cambridge community through our online discussion forums.

Find out more at www.cambridgeinternational.org/support



Sign up for email notifications about changes to syllabuses, including new and revised products and services at www.cambridgeinternational.org/syllabusupdates

Professional development

We support teachers through:

- Introductory Training – face-to-face or online
- Extension Training – face-to-face or online
- Enrichment Professional Development – face-to-face or online

Find out more at www.cambridgeinternational.org/events

- Cambridge Professional Development Qualifications

Find out more at www.cambridgeinternational.org/profdev

Supporting exams officers

We provide comprehensive support and guidance for all Cambridge exams officers. Find out more at: www.cambridgeinternational.org/eoguide



2 Syllabus overview

Aims

The aims describe the purposes of a course based on this syllabus.

It is expected that the subject matter will be treated practically as far as is possible. Some of the practical work will be in the form of demonstrations and visits to places of agricultural interest, but candidates will also be expected to have carried out individual and group practical work in agriculture, at least on a small scale, such as in a school garden.

The syllabus aims to:

- promote an appreciation of agriculture as an applied science
- stimulate an interest in, and create an awareness of, existing problems and opportunities in agricultural and rural development
- stimulate positive attitudes by showing that efficient farming can be both a profitable and a rewarding occupation
- demonstrate the value of agriculture to the family and community, so as to show how improved agriculture can contribute to the worldwide campaign for freedom from hunger
- encourage the teaching, in a practical manner, of basic principles and skills in agriculture and of efficient farm business management
- ensure that schools take an active part in rural development by integration of agricultural activities into the school curriculum
- encourage the development of a school farm, ensuring that students actively participate in the farming events throughout the course, including at weekends and during school holidays
- develop initiative, problem-solving abilities, scientific methods and self-education so as to encourage resourcefulness and self-reliance
- provide a basis, together with the basic sciences and mathematics, for more advanced studies in agriculture.



Cambridge Assessment International Education is an education organisation and politically neutral. The contents of this syllabus, examination papers and associated materials do not endorse any political view. We endeavour to treat all aspects of the exam process neutrally.

Content overview

The syllabus is divided into 10 topics designed to encourage a broad, applied and practical science-based study of agriculture.

It includes:

- 1 General agriculture
- 2 Soil
- 3 Principles of plant growth
- 4 Crop production
- 5 Crop protection
- 6 Livestock anatomy and physiology
- 7 Livestock production and health
- 8 Pasture management
- 9 Livestock and crop breeding
- 10 Farm structure and tools

Assessment overview

All candidates take two components. Candidates will be eligible for grades A* to E.

All candidates take:	and:
<p>Paper 1 1 hour 45 minutes</p> <p>Theory 70%</p> <p>100 marks</p> <p>Short, structured and extended response questions.</p> <p>This paper tests the subject content in section 3.</p> <p>These questions will assess AO1 and AO2.</p> <p>Externally assessed</p>	<p>Component 2</p> <p>Practical Coursework 30%</p> <p>90 marks</p> <p>Candidates undertake at least four practical exercises carried out during the course and a practical investigation.</p> <p>Internally assessed and externally moderated*</p>

Information on availability is in the **Before you start** section.

Check the timetable at www.cambridgeinternational.org/timetables for the test date window for Component 2.

Check the samples database at www.cambridgeinternational.org/samples for submission information, forms and deadlines for Component 2.

* The Practical Coursework is marked by the teacher and moderated by the Ministry in the candidate's home country or by Cambridge International.

Assessment objectives

The assessment objectives (AOs) are:

AO1 Knowledge and understanding

Candidates should be able to demonstrate agricultural knowledge and understanding of:

- facts, concepts, principles, patterns, models and theories
- terms, symbols, quantities and units
- the techniques, procedures and principles of safe agricultural practice.

Subject content defines the factual material that candidates may be required to recall and explain. Questions testing this objective will often begin with one of the following words: *define, state, name, describe, explain* or *outline* (see the *Glossary of terms*).

AO2 Handling information and solving problems

Candidates should be able – using oral, written, symbolic, graphical and numerical forms of presentation – to:

- locate, select, organise and present information from a variety of sources
- translate information from one form to another
- use information to identify patterns, report trends and draw inferences
- present reasoned explanations for phenomena, patterns and relationships
- make predictions and propose hypotheses
- solve problems, including some of a quantitative nature.

These assessment objectives cannot be precisely specified in the subject content because questions testing such skills may be based on information that is unfamiliar to the candidate. In answering such questions, candidates are required to use principles and concepts that are within the syllabus and apply them in a logical, reasoned or deductive manner to a novel situation.

Questions testing these objectives will often begin with one of the following words: *discuss, predict, suggest, calculate* or *determine* (see the *Glossary of terms*).

AO3 Practical skills and investigations

Candidates should be able to:

- use and organise techniques, apparatus and material
- observe, measure and record
- interpret and evaluate experimental observations and data
- plan and carry out investigations (and, where appropriate, make predictions and propose hypotheses).

Weighting for assessment objectives

The approximate weightings allocated to each of the assessment objectives (AOs) are summarised below.

Assessment objectives as a percentage of the qualification

Assessment objective	Weighting in O Level %
AO1 Knowledge with understanding	30
AO2 Handling information and solving problems	40
AO3 Practical skills and investigations	30
Total	100

Assessment objectives as a percentage of each component

Assessment objective	Weighting in components %	
	Paper 1	Component 2
AO1 Knowledge with understanding	45	–
AO2 Handling information and solving problems	55	–
AO3 Practical skills and investigations	–	100
Total	100	100

3 Subject content

This syllabus gives you the flexibility to design a course that will interest, challenge and engage your learners. Where appropriate you are responsible for selecting suitable subject contexts, resources and examples to support your learners' study. These should be appropriate for the learners' age, cultural background and learning context as well as complying with your school policies and local legal requirements.

Teachers should take note that there is a higher weighting for skills (including handling information, problem solving, practical, experimental and investigative skills) in the assessment than for knowledge and understanding. Teachers' schemes of work and the sequence of learning activities should reflect this balance.

It is expected that the subject matter will be treated practically as far as is possible. Some of the practical work will be in the form of demonstrations and visits to places of agricultural interest, but candidates will also be expected to have carried out individual and group practical work in agriculture, at least on a small scale, such as in a school garden.

1 General agriculture

1.1 General principles of land use

Candidates should be able to:

- (a) describe different forms of land use, including different agricultural systems and farming practices (rotations, mixed farming and monoculture), forestry and aquaculture
- (b) describe and explain the ways in which the uses of land in different areas may be limited by topographical, climatic and other environmental factors
- (c) understand that population growth leads to a need for efficient use of land and farm planning.

1.2 Principles of agricultural economics

Candidates should be able to:

- (a) describe organic production, hydroponics and genetically modified (GM) crops and be able to discuss arguments for and against the use of GM crops and organic production
- (b) explain the principles of supply and demand, diminishing returns, opportunities and choices facing the farmer, decision-making based on understanding of economic factors.

2 Soil

2.1 Soil formation

Candidates should be able to:

- (a) explain soil formation from parent material by physical, chemical and biological agents of weathering.

2.2 Soil types, composition, texture and temperature

Candidates should be able to:

- describe soil profile in terms of topsoil, subsoil and underlying materials
- describe soil texture in terms of different sizes of soil particles, sand, silt and clay
- understand soil structure, including the importance of forming and maintaining a good crumb structure, the effects of humus and maintenance of organic matter in the soil, oxidation of organic matter and the loss of soil structure causing capping and soil pans
- describe different soil types (sandy soils, loam soils and clay soils) and their properties, including water-holding capacity and drainage
- outline soil constituents in terms of mineral matter, organic matter, air, water (free or gravitational water, capillary and hygroscopic water) and living organisms (bacteria, nematodes, fungi and earthworms)
- understand the influence of soil temperature on the rate of plant growth, the danger of excessive heat to young seedlings and the danger of frost to some crops, and the methods of reducing the effect of extreme temperatures by mulching of seedbeds and shading of transplanted seedlings.

2.3 Soil fertility

Candidates should be able to:

- explain the importance of the following major nutrients to soil fertility and describe the signs and effects of their deficiency in plants: major nutrients – compounds of nitrogen, phosphorus, potassium, calcium, magnesium and sulfur
- carry out practical soil sampling and tests for soil pH
- describe the nitrogen cycle and its importance to soil fertility
- explain the importance of legumes and the use of organic fertilisers (manure and compost) in maintaining good soil structure and fertility
- describe the use of inorganic fertilisers (limited to **one** example each of a fertiliser containing predominantly phosphorus and predominantly potassium and **one** example of a compound fertiliser) in maintaining soil fertility
- explain how fertilising practices and liming can affect soil pH.

2.4 Soil erosion and soil conservation

Candidates should be able to:

- describe types of soil erosion, their causes, agents, prevention and control.

2.5 Drainage and irrigation

Candidates should be able to:

- describe drainage as movement of gravitational water down through the soil and understand the drainage of waterlogged land by means of ditches and the loss of plant nutrients due to leaching
- understand the effects of poor drainage on soil organisms and root respiration
- explain the need for irrigation and describe methods of irrigation with the effects on crop yield and quality (details of irrigation programmes for individual crops and of equipment specification are **not** required).

2.6 Water cycle

Candidates should be able to:

- (a) describe and understand the significance of the water cycle and ground-water resources.

3 Principles of plant growth

3.1 Movement of materials through plants

Candidates should be able to:

- (a) describe the distribution and function of root tissues and the structure and function of root hairs
- (b) explain the absorption of plant requirements from the soil, including the principles of diffusion, osmosis, the passage of water and dissolved mineral salts through vascular tissues
- (c) explain how the structure of a leaf is related to function (cellular detail is **not** required)
- (d) outline gas exchange by diffusion through the stomata
- (e) describe photosynthesis in terms of carbon dioxide, water, light and chlorophyll leading to the synthesis of carbohydrates and the production of oxygen
- (f) describe the distribution and function of tissues in a stem (dicotyledon only)
- (g) define the term *translocation* as the movement of synthesised food to storage organs and explain the principles of modification of different parts of plants to form food storage organs and the types of food materials stored
- (h) explain transpiration in terms of the transpiration stream, loss of water by evaporation and diffusion of water vapour through stomata
- (i) describe the effects of temperature, humidity, wind and light intensity on the rate of transpiration.

3.2 Reproduction in plants

Candidates should be able to:

- (a) define the term *sexual reproduction*
- (b) describe the structure and functions of the flowers of a maize plant and of a bean plant
- (c) define the term *pollination*
- (d) describe the process of fertilisation in a **named** plant
- (e) describe how seeds and fruits are dispersed and explain the importance of dispersal in relation to weed control
- (f) describe asexual reproduction from stem tubers (e.g. Irish potato and yam) and from stem cuttings (e.g. sweet potato, cassava and sugar cane).

3.3 Germination

Candidates should be able to:

- (a) describe seed structure and the germination of maize and bean (or other legume) and understand the conditions required for germination.

4 Crop production

4.1 Land preparation

Candidates should be able to:

- (a) describe land preparation by stumping and clearing and soil preparation by primary and secondary cultivations by hand or machine (e.g. ploughing or digging, harrowing or raking).

4.2 Cultivation of cash crops

Candidates should be able to:

- (a) name the main types of crop found locally (legumes, roots and tubers, edible fruits and cereals) and their products
- (b) describe in detail the cultivation of **one** crop of local importance in relation to:
- soil and climatic requirements
 - soil preparation
 - sowing or planting time and method
 - choice of suitable cultivars
 - seed rate and spacing
 - rates of application of fertiliser and manure
 - prevention and control of common pests, weeds and diseases
 - recognition of crop maturity
 - harvesting, yield and storage
 - record keeping (including a diary of events and production).

5 Crop protection

5.1 Weed control

Candidates should be able to:

- (a) identify one **named** local weed species of a crop and describe its harmful effects and the mode of spread
- (b) explain methods of weed control including cultural, mechanical and chemical methods.

5.2 Pest control

Candidates should be able to:

- (a) describe the life cycle, effect and method of spread of **one** pest from **each** of the following:
- biting and chewing pests (e.g. grasshoppers, locusts, termites, leaf miners and beetles)
 - piercing and sucking pests (e.g. aphids, Bagrada bugs, mealy bugs and scale insects)
 - boring pests (e.g. weevils, stalk borer and American bollworm (*Helicoverpa armigera*))
- (b) name and describe the mode of action of chemical controls for pests including contact pesticides and systemic pesticides and understand the appropriate use of these pesticides in controlling pests in the groups listed above
- (c) describe biological and biotechnical methods of controlling pests
- (d) describe methods of cultural pest control including rotation and catch cropping.

5.3 Disease control

Candidates should be able to:

- (a) describe the mode of infection, harmful effects, prevention and control of **one named** plant disease from each of the following groups:
- bacterial diseases
 - fungal diseases
 - viral diseases.

5.4 The use of farm chemicals

Candidates should be able to:

- (a) explain the importance and methods of safe handling of farm chemicals, including the use of specifically designed protective clothing, correct dilution and mixing, precautions before, during and after application and avoidance of pollution when cleaning spraying equipment
- (b) explain the importance of safe storage of farm chemicals to include chemicals that are toxic, (e.g. herbicides, insecticides and flammable, e.g. fuels).

6 Livestock anatomy and physiology

6.1 Digestion in ruminants and non-ruminants

Note

The differences between ruminant and non-ruminant digestion should be discussed generally but can be illustrated using relevant examples from local agriculture. Examples of ruminants include sheep, cows and goats. Examples of non-ruminants include pigs and poultry.

Candidates should be able to:

- (a) describe the structure and function of the digestive system of a ruminant and a non-ruminant
- (b) describe the processes of digestion and absorption in the alimentary canals of a ruminant and a non-ruminant (reference to specific enzymes is **not** required).

6.2 Sexual reproduction in mammals

Candidates should be able to:

- (a) describe the reproductive systems (male and female) of a **named** mammalian farm animal
- (b) describe the processes of fertilisation and birth in a **named** mammalian farm animal
- (c) define the terms *weaning* and *lactation* and understand the importance of colostrum.

7 Livestock production and health

Study of **one** ruminant and **one** non-ruminant animal with particular reference to:

7.1 Livestock housing

Candidates should be able to:

- (a) describe suitable housing and living conditions for livestock
- (b) describe the care and rearing of young stock.

7.2 Livestock nutrition

Candidates should be able to:

- (a) describe the nutritional requirements (including food materials, their nutritional content and signs of deficiency) and feeding practices (including the importance of a balanced ration suited to the age and the stage of development of the livestock)
- (b) outline the meaning of the terms *maintenance ration* and *production ration*
- (c) explain the importance of an adequate, clean water supply
- (d) demonstrate stockmanship, including care in the handling of animals, record keeping, including a diary of events and production records.

7.3 Livestock health

Candidates should be able to:

- (a) recognise the signs of health and of ill-health in livestock
- (b) explain the ways in which infectious and contagious diseases are spread
- (c) explain the problems caused by parasites
- (d) explain what is meant by the terms *notifiable/scheduled diseases*
- (e) explain the importance of livestock hygiene and the isolation of sick animals.

8 Pasture management

8.1 Extensive and intensive pasture management

Candidates should be able to:

- (a) describe the vegetation of grazing lands, including grasses and legumes for grazing and bush for browsing
- (b) describe how improved pastures can be established
- (c) explain what is meant by the terms *rotational grazing*, *paddock* and *zero grazing*, *unenclosed* and *enclosed grazing systems* and *intensive* and *extensive grazing*
- (d) describe extensive management methods, including the importance of stocking rates, carrying capacity and the dangers of overstocking, bush control and the use and misuse of fire
- (e) explain how pasture utilisation can be improved by fencing and rotational grazing.

9 Livestock and crop breeding

9.1 Monohybrid inheritance

Candidates should be able to:

- define the terms *chromosome*, *gene*, *allele*, *homozygous*, *heterozygous*, *dominant* and *recessive*
- calculate and predict the results of simple genetic crosses involving 1:1 and 3:1 ratios
- explain the meaning of the terms *genotype* and *phenotype* and assess their importance in animal and plant breeding.

9.2 Selective breeding in animals and plants

Candidates should be able to:

- describe how breeding can improve yield, disease resistance, hardiness and appearance in livestock and in crops
- understand the role of artificial selection in the production of improved varieties of animals and plants of economic importance
- understand the benefits of artificial insemination
- understand the differences between selective crop breeding and genetically modified (GM) crops.

10 Farm structures and tools

10.1 Fencing

Candidates should be able to:

- describe the treatment of fencing posts, methods of fence construction, types of fence suitable for different purposes, the use of hedges and windbreaks.

10.2 Farm buildings

Candidates should be able to:

- outline the properties and uses of wood, concrete blocks, metal, stone, brick, earth and thatch in the construction of farm buildings.

10.3 Farm water supplies

Candidates should be able to:

- list suitable sources of water for human consumption, for livestock and for irrigation
- outline methods of water treatment by settling and filtration
- outline suitable methods of construction of storage dams to resist water pressure, which increases with depth
- describe the use of storage tanks, the distribution of water through pipe systems and simple plumbing, sufficient for maintaining a plastic pipe system, including pipe-joining and fitting of tap washers.

10.4 Farm tools

Candidates should be able to:

- (a) describe the use and maintenance of saw, hammer, screwdriver, file, spanner, sprayers and hand tools for cultivation.

10.5 Farm machinery

Candidates should be able to:

- (a) explain the advantages and disadvantages of farm mechanisation
- (b) describe the use and maintenance of mould-board plough, cultivator, harrow, planter and ridger (either ox- or donkey- or tractor-drawn).

4 Details of the assessment

All candidates take two components.

Paper 1 Theory

Written paper, 1 hour 45 minutes, 100 marks

Section A: 70 marks

Candidates answer **all** questions in Section A.

Short answer questions and structured questions testing AO1 and AO2.

Section B: 30 marks

Candidates answer **two** questions from a choice of five in Section B. Each question is worth 15 marks.

Free response structured questions testing AO1 and AO2.

Externally assessed

Component 2 Practical Coursework

90 marks

The coursework consists of at least **four** discrete practical exercises and one practical investigative project which takes the form of a report.

Practical work assesses skills and abilities essential to the study of agriculture that are not suitably measured by theory examinations. All candidates must complete practical exercises and an investigation.

Practical exercises 60 marks

Candidates are assessed on four practicals. They are to be spread evenly over the course where possible.

Practical investigation 30 marks

Candidates choose an investigation topic, produce a hypothesis, plan and carry out an investigation, collect data, analyse the results and make a conclusion. A written report of no more than 1000 words should evaluate the project including the limitations of the investigation.

This component tests assessment objective AO3.

Internally assessed and externally moderated.

Planning Practical Exercises and Practical Investigation tasks

The practical work carried out by candidates should be assessed by the agriculture teacher. This entails keeping a record for all the candidates, showing the operations carried out and the marks awarded.

It is the responsibility of the teacher to ensure that the work planned is safe and legally permitted by local legislation. It is recommended that a simple risk assessment be carried out by the teacher for each of the practical tasks and investigations to ensure that the health and safety of the candidates is not put at risk by the planned activities. See the *Coursework Handbook* for more information on health and safety. The *Coursework Handbook* can be found on the School Support Hub at www.cambridgeinternational.org/support

Centres are free to carry out more than four practical exercises, submitting only those they consider to be the best four. You may wish to combine up to three of the practical exercises with the practical investigation. Alternatively you may prefer the simplicity of keeping the two parts of the assessment separate.

Practical exercises

You should assess at least four discrete practical exercises over the course but may choose to do more practical exercises and choose the best four for submission.

They are to be spread evenly over the course where possible.

It is important that the practical exercises are taught as part of the delivery of the relevant syllabus area before candidates are assessed on the practical aspects of the topic. Vegetable production, animal husbandry, soil and crop husbandry all offer opportunities for learners to develop assessable skills.

Practical investigation

The main aim of the investigation is that it should be done by the individual candidate, in connection with some particular study problem.

The practical work done during this investigation can be organised in such a way as to constitute practical exercises which can be submitted for the assessment of the practical exercises. Up to a **maximum of three** discrete practical exercises may be assessed during the carrying out of the investigation at the discretion of the teacher.

Teachers should consider the facilities in the centre and other local facilities, local growing/breeding seasons and how these relate to teaching time and the requirement to spread the practical exercises across the course when planning the practical exercises and investigation. See the *Coursework Handbook* for more information on planning practical exercises and practical investigation. The *Coursework Handbook* can be found on our support site at www.cambridgeinternational.org/support

Practical Exercises

The practical exercises should be spread evenly over the course where possible.

The practical exercises should ideally be drawn from as many sections of the syllabus as possible.

Examples of tasks suitable for the practical exercises

Almost any agricultural task or activity can be used as a basis for the assessment of practical skills through the practical exercises. Such tasks may be carried out in almost any agricultural context, from school or college farms, through allotments and backyard chicken- or bee-keeping to extensive forestry or cattle ranching.

It is essential that the candidates have sufficient opportunity to acquire and practice the skills before the assessment so that they can confidently show what they can do.

Tasks associated with crop production

Any plant or non-plant crop is suitable. The tasks may involve manual tasks (e.g. digging with a spade or adze) or mechanised or animal-powered tasks (e.g. ploughing) or a combination of these.

- digging to produce a rough tilth
- ploughing
- preparation of a seedbed
- seed sowing (drills left open for checking depth and spacings)
- fertilising (calculation of quantities, placement, top dressing)
- transplanting and shading
- mulching
- weeding
- pruning
- crop protection (spraying, pest and disease control)
- harvesting and storage of crops

Examples of suitable tasks associated with livestock/poultry production

The animals involved may be conventional livestock, poultry or any other agricultural animal production (e.g. bees, farmed fish or silkworm larvae). The tasks may be manual (e.g. removing soiled bedding and replacement with clean material) or mechanised (e.g. herding using a quad-bike, milking using a mechanical milking parlour) or a combination of these.

Candidates must have been properly trained in dealing with the animals, both for their own safety and also to ensure the humane treatment of the animals concerned.

The following are examples of tasks that will prove suitable. Again, this is not a list of all the possibilities (and the bracketed sections beginning 'including ...' are not comprehensive lists of all the activities that might make up the task, and the task selected might not include all of the listed activities).

- herding (including keeping the herd together; avoiding predators; ensuring access to food and clean water)
- tending animals in any enclosure (e.g. field, chicken run or house) (including ensuring access to food and water; dealing with waste; providing clean bedding; measures to minimise the risk of disease)
- enclosure and house maintenance (including fence construction or maintenance; hedge planting or maintenance; construction, routine maintenance, repair, cleaning or disinfection of housing, pens and nest boxes)
- dealing with disease (including measures to avoid disease, identification of diseased animals, isolation, appropriate treatment where possible [e.g. application of oil to poultry infected with scaly leg mite], disinfection of housing; deciding when to ask for advice [e.g. from an experienced farmer or veterinarian])
- husbandry (including selection of animals suitable for breeding, care for breeding animals, preparations for nesting, birth or hatching, supervision of birthing or hatching, care of newborn or newly hatched animals, deciding when to ask for advice)
- obtaining the product (including milking; collection, grading, cleaning and preparation of eggs for consumption or sale; humane preparations for taking stock to market)

Evidence of performance of practical exercises

The practical exercises will involve candidates in tasks and activities in which they demonstrate skills which will be assessed and will generate evidence of the demonstration of the skill for moderation.

Assessment of the practical exercises by the teacher needs to take place at the time of the performance of the skill by the candidate in order to ensure that the assessment is authentic. The teacher may well use ticksheets, notes or other teacher-dated records to document the assessment, for later transfer onto the mark sheets. However, these tick-sheets and teacher-dated records do not provide evidence of the candidate's performance that is suitable for moderation since such evidence should show the candidate performing the task or activity.

The evidence of the practical exercises submitted for moderation can take many forms. In each case what is being sought is authentic evidence that shows that the candidate has carried out the various chosen practical tasks or activities. The evidence should show that the candidate has skills in such practical agricultural work, and also when the work was carried out.

The preferred forms of evidence are those generated by the candidate and those showing the candidate carrying out the work. See the *Coursework Handbook* for more information on evidence for practical exercises. The *Coursework Handbook* can be found on our support site at www.cambridgeinternational.org/support

Authentic records must include the date when the practical activity took place and may include:

- Photographs of the candidate doing the task or activity. The images must clearly show the individual candidate carrying out the skill being assessed. These images may be presented in any convenient form (e.g. JPEG, GIF or BMP) or in a document or presentation with written or audio annotations referring to the skills, by the candidate, as well as their thoughts about their own performance of those skills (critical reflections).
- Short videos of the candidate carrying out the task or activity (not longer than 1 minute per activity). No editing or titles are required but candidates should add annotations and critical reflections as an audio or written commentary. Any common format is suitable (e.g. AVI or MPEG).
- Original diaries or notes recording the candidates carrying out of the tasks and activities. These must not be edited or written up neatly. They should be the authentic records kept by the candidate of the skills, and critical reflections, at the time of doing the task or activity. These should be scanned or clearly photographed.

For information, dates and methods of submission of the coursework marks and sample, please refer to the samples database at www.cambridgeinternational.org/samples

Method of assessment for Practical Exercises

The total mark available for the four practical exercises is 60 marks. For each practical exercise task the total is 15 marks, with 3 marks being available for each of the five assessment criteria.

Teachers must ensure that all work produced by candidates and records of assessment are retained and are available for inspection, if required, by the external Coursework Moderator.

Marking criteria for Practical Exercises

Each practical exercise should be assessed according to the Marking Criteria for the assessment of Practical Exercises.

Each practical exercise should be marked using the following criteria:

Criteria	Description	Marks available
1 Responsibility	the ability to assume responsibility for the task in hand, and to work from given instructions without detailed supervision and help	3
2 Initiative	the ability to cope with problems arising in connection with the task, to see what needs to be done and to take effective action	3
3 Technique	the ability to tackle a practical task in a methodical, systematic way, and to handle tools skilfully and to good effect	3
4 Perseverance	the ability to see a task through to a successful conclusion with determination and sustained effort	3
5 Quality	the ability to attend to detail, so that the work is well finished and is well presented	3

Marking Criteria for the assessment of Practical Exercises

Teachers should make a best-fit match between the candidate's performance in each of the criteria for the practical exercises and the level descriptors.

Responsibility	Marks
<ul style="list-style-type: none"> Follows written or verbal instructions without the need for help Carries out appropriate safety procedures Assumes responsibility easily and leads in group work 	3
<ul style="list-style-type: none"> Follows written or verbal instructions with a little help Is aware of the need for safety procedures but has difficulty recognising them without guidance Shows responsibility for the work 	2
<ul style="list-style-type: none"> Follows written or verbal instructions with considerable help Shows little regard for safety procedures, even when told Shows some responsibility for the work 	1
<ul style="list-style-type: none"> No creditable response 	0

Initiative	Marks
<ul style="list-style-type: none"> Offers solutions or explanations to unexpected problems Recognises, and is able to anticipate, problems Solves problems without help Comments on imperfections of experimental methods or results 	3
<ul style="list-style-type: none"> Offers solutions or explanations to unexpected problems after seeking advice Solves problems with help Recognises faults in experimental methods, given some pointers 	2
<ul style="list-style-type: none"> Is uncertain how to proceed and requires considerable help Recognises only the most obvious errors in experimental methods after considerable guidance 	1
<ul style="list-style-type: none"> No creditable response 	0
Technique	Marks
<ul style="list-style-type: none"> Approaches tasks methodically and systematically Handles tools/apparatus skilfully and confidently Carries out practical procedures with dexterity 	3
<ul style="list-style-type: none"> Handles tools/apparatus effectively Carries out practical procedures adequately 	2
<ul style="list-style-type: none"> Handles tools/apparatus clumsily Carries out practical procedures with difficulty 	1
<ul style="list-style-type: none"> No creditable response 	0
Perseverance	Marks
<ul style="list-style-type: none"> Completes all the required practical tasks and associated written work Has a positive attitude and is well motivated 	3
<ul style="list-style-type: none"> Completes the required practical tasks and attendant written work with a little encouragement Carries out repetitive procedures willingly 	2
<ul style="list-style-type: none"> Does not complete the required practical tasks and attendant written work Is somewhat disinterested/impatient when carrying out work and is disinclined to repeat procedures 	1
<ul style="list-style-type: none"> No creditable response 	0

Quality	Marks
<ul style="list-style-type: none"> Performs practical work thoroughly, pays attention to detail and produces a very good final result Produces accurate, clear and neatly presented written work 	3
<ul style="list-style-type: none"> Performs practical work thoroughly for the most part and produces a satisfactory to good result Produces mostly accurate and clearly presented written work 	2
<ul style="list-style-type: none"> Performs practical work in a rushed and superficial way and shows little concern for the finished product Produces inaccurate and poorly presented written work 	1
<ul style="list-style-type: none"> No creditable response 	0

Practical Investigation

The practical investigation is a major piece of work and should be investigatory in nature.

The report produced should be presented carefully and include a hypothesis, plan for how to carry out an investigation of this hypothesis, a record and analysis of data collected and conclusions made. The report should also consider limitations of the investigation.

The main aim of the investigation is that it should be done by the individual candidate, in connection with some particular study problem.

Agriculture offers a wide scope for such projects, and it should not be difficult to find suitable topics, bearing in mind the following principles:

- The work must be investigatory. Candidates must find the information for themselves by direct observation and measurement.
- Though the programme of study must be carried out by the candidate, it is the teacher's responsibility to guide the candidate, or even to select problems that suit the candidate's investigatory abilities. The teacher may also suggest methods of investigation that are likely to be effective. Candidates are not research workers but, when given appropriate guidance, they can learn how to carry out investigations for themselves.
- The nature of the problem to be investigated should be stated and discussed by the candidate in the introduction.
- Time allocated to investigation work should be approximately five periods of 40 minutes, including homework. This should be enough to achieve a good standard. Candidates should be discouraged from spending so much time on their projects that their normal classwork suffers.
- Candidates will not necessarily solve all the problems they tackle, but they should make a worthwhile attempt to do so. When problems fail to yield positive results, candidates should be encouraged to discuss their actual findings and comment on the implications. Good investigation work by candidates often leads them to understand the difficulties and subtleties of the problem, and this can be very educational. For some candidates, negative results can be depressing, and teachers must use their judgement when guiding them, so that they do not become discouraged.

Examples of acceptable investigations

Investigations can be based on a variety of topics.

Teachers should provide advice for learners in selecting suitable questions and hypotheses. See the *Coursework Handbook* for more guidance on helping candidates select suitable topics for practical investigations. The *Coursework Handbook* can be found on our School Support Hub at www.cambridgeinternational.org/support

The following examples are intended as a guide, but teachers may wish to help their candidates to devise investigations of their own along similar lines.

Field experiments

- comparison of sowing depths, to discover effects; minimum, optimum and maximum depths
- thinning of root crops; no thinning, thinning to various spacings, effects upon total yield and size of roots produced
- plant population in relation to yield; spacing of plant stations and rows, comparison to find optimum spacings
- spraying versus not spraying; effects on infestation with disease or pest organisms, effects on yield, cost-effectiveness
- top-dressing versus not top-dressing; various treatments and effects, comparison of costs and yields
- fertiliser trials; organic versus inorganic, effects of differing application rates upon yields, diminishing returns
- rationing of livestock feed versus ad-lib feeding; effects on production, cost-effectiveness
- effects of different levels of nutrition on young stock (e.g. broiler chickens); measurement of live mass gain under different rationing regimes, effects on health, cost-effectiveness

In the case of field trials, it is often useful to have a group of candidates involved, in order to make possible replication of treatments on plots in different parts of the garden or field. This improves the statistical accuracy of the trial. However, each candidate's contribution must be assessed and **individual reports must be written**.

When different treatments are tried, the effect upon yield of produce is often a factor to be measured. The cost-effectiveness of alternative treatments should also be worked out, to see which one is the most profitable.

Attention should be paid to the presentation of results in a clear and concise form, i.e. tabulation or graphical representation. Reasons should always be given for treatments carried out, methods tried, or conclusions reached.

An example of how the practical exercises may be integrated within the practical investigation

A candidate has decided to carry out an investigation into the effect of nitrate fertiliser on the yield of cabbages. Having proposed a hypothesis with the scientific reasons behind it and planned a suitable investigation, the practical work is carried out. The first practical assessment could involve the preparation of the soil seedbed. The second assessment could involve the planting and spacing of cabbages and the application of nitrate fertiliser. The third assessment could involve harvesting and measuring the cabbage yield. The recording of the data, subsequent analysis and limitations are then written up as part of the practical investigation.

Evidence of the practical investigation

The assessable evidence of the investigation is the 1000 word report.

Title: The report should have a clear title. This should appear on the first page, together with the name of the candidate and the name of the school.

Contents: A list of contents should be included, showing clearly the main sections of the report and the numbers of pages where they appear. Lists of tables, graphs and photographs can also be included, if appropriate.

Introduction: This should state the objective(s) of the investigation, the questions to be asked or a hypothesis, and describe briefly the plans for carrying it out. Sources of material, such as reference books or people interviewed, should be acknowledged. Details of the time (with dates) and the place where the investigation was carried out should be given.

Methodology: A description of the investigation. Relevant details of the methods used to plan, sample, measure, collect and analyse data.

Presentation of data findings: Data collected should be presented in this section as tables, charts, graphs or histograms. They must always be labelled with a brief description of the data.

Findings and conclusions: The conclusions of the investigation should be summarised in a few paragraphs. The findings should be compared to the original plan set out in the introduction. Limitations of the data should be noted and suggestions made for improvements. Help received from other people should be acknowledged.

See the *Coursework Handbook* for more guidance on the format and presentation of the report for the practical investigation. The *Coursework Handbook* can be found on our School Support Hub at www.cambridgeinternational.org/support

Method of assessment for the Practical Investigation

The practical investigation is marked out of a total of 30 marks with 5 marks allocated for each of the six assessment criteria.

Teachers must ensure that all work produced by candidates and records of assessment are retained and are available for inspection, if required, by the external Coursework Moderator.

Marking criteria for Practical Investigation

Each practical investigation should be assessed according to the Marking Criteria for the assessment of Practical Investigation.

Each practical investigation should be marked using the following criteria:

Criteria	Description	Marks available
1	The selection of relevant questions (hypothesis) for the investigation	5
2	The planning of the investigation and the principles on which it is based	5
3	The handling of evidence	5
4	The ability to make deductions from the evidence or the data acquired	5
5	The ability to recognise limitations of the investigation	5
6	Description of practical, presentation, layout and originality (candidate's own work)	5

Marking Criteria for the assessment of Practical Investigation

Teachers should make a best-fit match between the candidate's performance in each of the criteria for the practical investigation and the level descriptors.

1	The selection of relevant questions (hypothesis) for the investigation	Marks
•	Relevant questions (hypothesis) selected without guidance, appropriate and clearly stated	5
•	Relevant questions (hypothesis) selected without guidance, appropriate but poorly expressed	4
•	Relevant questions (hypothesis) selected with guidance, appropriate and clearly stated	3
•	Relevant questions (hypothesis) selected with guidance, appropriate but poorly expressed	2
•	Relevant questions (hypothesis) selected with considerable guidance	1
•	Relevant questions (hypothesis) provided for the candidate	0
2	The planning of the investigation and the principles on which it is based	Marks
•	Investigation well-planned, without guidance, showing evidence that the relevant principles are understood	5
•		4
•	Investigation adequately planned, with some guidance, relevant principles understood	3
•		2
•	Investigation plan sketchy, plan produced with considerable guidance or no evidence that principles are understood	1
•	Investigation plan provided for the candidate	0

3 The handling of evidence	Marks
• Results presented neatly and clearly in a table, appropriate method of analysis chosen, graphs and/or histograms accurate and correctly presented (i.e. correct scale, axis, labelling, etc.)	5
•	4
• Results presented neatly and clearly in a table, inappropriate method of analysis chosen, graphs and/or histograms inaccurate and incorrectly presented	3
•	2
• Results not presented in a table, inappropriate method of analysis chosen, graphs and/or histograms inaccurate and poorly presented	1
• No creditable response	0
4 The ability to make deductions from the evidence or the data acquired	Marks
• Comprehensive deductions based on the evidence, conclusions given with reasons	5
• Several deductions based on the evidence, conclusions given with reasons	4
• Few deductions based on the evidence, one conclusion given	3
• Few deductions based on the evidence, no conclusions given	2
• One deduction, no elaboration	1
• Tasks carried out with considerable help, inaccurate observations and records	0
5 The ability to recognise limitations of the investigation	Marks
• All major limitations identified, assessed and improvements suggested	5
•	4
• Several limitations identified, assessment superficial, no improvements suggested	3
•	2
• One or two limitations identified but no assessments or improvements given	1
• No creditable response	0

6	Description of investigation, presentation, layout and originality (candidate's own work)	Marks
•	Clear, full description of the aims and nature of the topic; work neat and well presented; layout as required by the syllabus; candidate's own work	5
•		4
•	Description of the aims and nature of the investigation given; lacking in either neat presentation or layout not as required by the syllabus; candidate's own work	3
•		2
•	Outline only of the aims and nature of the investigation; poorly presented; layout not as required by the syllabus; candidate's own work	1
•	No creditable response	0

Submission of coursework

Each candidate will have a mark out of 90 marks for their Practical Coursework. This is made up of a mark out of 60 for the four practical exercises and a mark out of 30 for the practical investigation.

The evidence for each candidates' work should be assembled in a folder (electronic if possible).

Recording and submitting candidates' marks and work

Please refer to the samples database at www.cambridgeinternational.org/samples for information, dates and methods of submission of candidates' marks and work.

You should record candidates' marks for the Practical Coursework on the Individual Candidate Record Card and the Coursework Assessment Summary Form which you should download each year from the samples database at www.cambridgeinternational.org/samples. The database will ask you for your country/territory and the syllabus code (i.e. 5038), after which it will take you to the correct forms. Follow the instructions on the form to complete it.

The marks on these forms must be identical to the marks you submit to Cambridge International.

Internal moderation

If more than one teacher in your centre is marking internal assessments, you must make arrangements to moderate or standardise your teachers' marking so that all candidates are assessed to a common standard. (If only one teacher is marking internal assessments, no internal moderation is necessary.) You can find further information on the process of internal moderation on the samples database at www.cambridgeinternational.org/samples

You should record the internally moderated marks for all candidates on the Coursework Assessment Summary Form and submit these marks to Cambridge International according to the instructions set out in the *Cambridge Handbook* for the relevant year of assessment.

External moderation

Cambridge International will externally moderate all internally assessed components.

- You must submit the marks of all candidates to Cambridge International.
- You must also submit the marked work (filmed evidence and documentation) of a sample of candidates to Cambridge International.

The sample you submit to Cambridge International should ideally include examples of the marking of each teacher. The samples database at www.cambridgeinternational.org/samples explains how the sample will be selected.

The samples database at www.cambridgeinternational.org/samples also provides details of how to submit the marks and work.

External moderators will produce a short report for each centre with feedback on your marking and administration of the assessment.

5 Appendix

Physical and chemical concepts and processes

For the purpose of assessment, candidates will be expected to demonstrate:

- 1 an understanding of temperature, pressure, evaporation and relative humidity
- 2 an understanding of the terms *element*, *mixture*, *compound*, *atom*, *molecule* and *ion*
- 3 an understanding of the terms *acid*, *base* and *pH value*
- 4 an understanding of energy transfer/conversion.

Mathematical requirements

Calculators may be used in all parts of the assessment.

Candidates should be able to:

- 1 add, subtract, multiply and divide
- 2 understand averages, decimals, fractions, percentages and ratios
- 3 understand the relationship between surface area and volume
- 4 use direct and inverse proportion
- 5 draw charts and graphs, including histograms, from given data
- 6 interpret charts and graphs
- 7 select suitable scales and axes for graphs.

Terminology, units, symbols and presentation of data for agriculture

This section follows the practice laid down in the following documents:

- Association for Science Education booklet
Signs, Symbols and Systematics: The ASE Companion to 16–19 Science (2000)
- Institute of Biology
Biological Nomenclature, Standard terms and expressions used in the teaching of Biology (2000)

Candidates should be made aware of the information given in this section during teaching and practical work, as it will be used in examination papers.

Nomenclature

The proposals in '*Signs, Symbols and Systematics (The Association for Science Education Companion to 16–19 Science, 2000)*' and the recommendations on terms, units and symbols in '*Biological Nomenclature (2000)*' published by the Institute of Biology, in conjunction with the ASE, will generally be adopted. Reference should be made to the joint statement on chemical nomenclature issued by the GCE boards. In particular, the traditional names sulfate, sulfite, nitrate, nitrite, sulfurous and nitrous acids will be used in question papers.

Units, significant figures

Candidates should be aware that misuse of units and/or significant figures, i.e. failure to quote units where necessary, the inclusion of units in quantities defined as ratios or quoting answers to an inappropriate number of significant figures, is liable to be penalised.

Units

The International System of units will be used (SI units). Units will be indicated in the singular not in the plural, e.g. 28 kg.

(a) SI units commonly used in agriculture

Note: Care should be taken in the use of *mass* and *weight*. In many agricultural contexts, the term *mass* is correct, e.g. dry mass, biomass.

Quantity	Name of unit	Symbol for unit
length	kilometre	km
	metre	m
	centimetre	cm
	millimetre	mm
	micrometre	μm
mass	tonne (1000 kg)	t
	kilogram	kg
	gram	g
	milligram	mg
	microgram	μg
time	year	y
	day	d
	hour	h
	minute	min
	second	s
amount of substance	mole	mol

(b) Derived SI units

Quantity	Name of unit	Symbol for unit
energy	kilojoule	kJ
	joule (calorie is obsolete)	J

(c) Recommended units for area, volume and density

Quantity	Name of unit	Symbol for unit
area	hectare = 10^4 m^2	ha
	square metre	m^2
	square decimetre	dm^2
	square centimetre	cm^2
	square millimetre	mm^2
volume	cubic kilometre	km^3
	cubic metre	m^3
	cubic decimetre (preferred to litre)	dm^3
	litre	dm^3 (not <i>l</i>)
	cubic centimetre	cm^3
	cubic millimetre	mm^3
density	kilogram per cubic metre	or kg m^{-3}
	gram per cubic centimetre	or g cm^{-3}

(d) Use of solidus

The solidus (/) will **not** be used for a quotient, e.g. m/s for metres per second.

Presentation of data

The solidus (/) is to be used for separating the quantity and the unit in tables, graphs and charts, e.g. time/s for time in seconds.

(a) Tables

- Each column of a table will be headed with the physical quantity and the appropriate SI unit, e.g. time / min.
- There are three acceptable methods of stating units, e.g. metres per sec *or* m per s *or* m s^{-1} .
- The column headings of the table can then be directly transferred to the axes of a constructed graph.

(b) Graphs

- The independent variable will be plotted on the x-axis (horizontal axis) and the dependent variable plotted on the y-axis (vertical axis).
- Each axis will be labelled with the physical quantity and the appropriate SI unit, e.g. time/min.
- The graph is the whole diagrammatic presentation. It may have one or several curves plotted on it.
- Curves and lines joining points on the graph should be referred to as 'curves'.
- Points on the curve should be clearly marked as crosses (x) or encircled dots (⊙). If a further curve is included, vertical crosses (+) may be used to mark the points.

(c) Pie charts

These should be drawn with the sectors in rank order, largest first, beginning at 'noon' and proceeding clockwise.

(d) Bar charts

These are drawn when one of the variables is not numerical, e.g. number of eggs of different colours. They should be made up of narrow blocks of equal width that do **not** touch.

(e) Column graphs

These are drawn when plotting frequency graphs from discrete data, e.g. frequency of occurrence of nests with different numbers of eggs. They should be made up of narrow blocks of equal width that do **not** touch.

(f) Histograms

These are drawn when plotting frequency graphs with continuous data, e.g. frequency of occurrence of stems of different lengths or chicks of different masses. The blocks should be drawn in order of increasing or decreasing magnitude and they **should** be touching.

Glossary of command terms used in science papers

During the moderation of a question paper, care is taken to ensure that the paper and its individual questions are, in relation to the syllabus, fair as regards balance, overall difficulty and suitability.

Attention is also paid to the wording of questions to ensure that it is as concise and as unambiguous as possible. In many instances, Examiners are able to make appropriate allowance for an interpretation that differs, but acceptably so, from the one intended.

It is hoped that the glossary will prove helpful to candidates as a guide (i.e. it is neither exhaustive nor definitive). The glossary has been deliberately kept brief not only with respect to the number of terms included but also to the descriptions of their meanings. Candidates should appreciate that the meaning of a term must depend, in part, on its context.

- 1 *Define* (the term(s)...) is intended literally, only a formal statement or equivalent paraphrase being required.
- 2 *What is meant by* (the term(s)...) normally implies that a definition should be given, together with some relevant comment on the significance or context of the term(s) concerned, especially where two or more terms are included in the question. The amount of supplementary comment intended should be interpreted in the light of the indicated mark value.
- 3 *State* implies a concise answer with little or no supporting argument (e.g. a numerical answer that can readily be obtained 'by inspection').
- 4 *List* requires a number of points, generally each of one word, with no elaboration. Where a given number of points is specified, this should not be exceeded.
- 5 (a) *Explain* may imply reasoning or some reference to theory, depending on the context. It is another way of asking candidates to give reasons for something. The candidate needs to leave the examiner in no doubt **why** something happens.
(b) *Give a reason/Give reasons* is another way of asking candidates to explain **why** something happens.
- 6 (a) *Describe*, the data or information given in a graph, table or diagram, requires the candidate to state the key points that can be seen in the stimulus material. Where possible, reference should be made to numbers drawn from the stimulus material.
(b) *Describe*, a process, requires the candidate to give a step-by-step written statement of what happens during the process.
Describe and *explain* may be coupled, as may *state* and *explain*.
- 7 *Discuss* requires the candidate to give a critical account of the points involved in the topic.
- 8 *Outline* implies brevity (i.e. restricting the answer to giving essentials).
- 9 *Predict* implies that the candidate is not expected to produce the required answer by recall but by making a logical connection between other pieces of information. Such information may be wholly given in the question or may depend on answers extracted in an earlier part of the question.
Predict also implies a concise answer, with no supporting statement required.

- 10 *Deduce* is used in a similar way to *predict* except that some supporting statement is required (e.g. reference to a law/principle, or the necessary reasoning is to be included in the answer).
- 11 *Suggest* is used in two main contexts (i.e. either to imply that there is no unique answer (e.g. in chemistry, two or more substances may satisfy the given conditions describing an 'unknown') or to imply that candidates are expected to apply their general knowledge to a 'novel' situation, one that may be formally 'not in the syllabus').
- 12 *Find* is a general term that may variously be interpreted as *calculate*, *measure*, *determine*, etc.
- 13 *Calculate* is used when a numerical answer is required. In general, working should be shown, especially where two or more steps are involved.
- 14 *Measure* implies that the quantity concerned can be directly obtained from a suitable measuring instrument (e.g. length, using a rule, or mass, using a balance).
- 15 *Determine* often implies that the quantity concerned cannot be measured directly but is obtained by calculation, substituting measured or known values of other quantities into a standard formula (e.g. the Young modulus, relative molecular mass).
- 16 *Estimate* implies a reasoned order of magnitude statement or calculation of the quantity concerned, making such simplifying assumptions as may be necessary about points of principle and about the values of quantities not otherwise included in the question.
- 17 *Sketch*, when applied to graph work, implies that the shape and/or position of the curve need only be qualitatively correct, but candidates should be aware that, depending on the context, some quantitative aspects may be looked for (e.g. passing through the origin, having an intercept, asymptote or discontinuity at a particular value).
In diagrams, *sketch* implies that a simple, freehand drawing is acceptable; nevertheless, care should be taken over proportions and the clear exposition of important details.

In all questions, the number of marks allocated are shown on the examination paper and should be used as a guide by candidates to how much detail to give. In describing a process, the mark allocation should guide the candidate about how many steps to include. In explaining why something happens, it guides the candidate to how many reasons to give, or how much detail to give for each reason.

6 What else you need to know

This section is an overview of other information you need to know about this syllabus. It will help to share the administrative information with your exams officer so they know when you will need their support. Find more information about our administrative processes at www.cambridgeinternational.org/eoguide

Before you start

Previous study

We do not expect learners starting this course to have previously studied agriculture.

Guided learning hours

We design Cambridge O Level syllabuses based on learners having about 130 guided learning hours for each subject during the course but this is for guidance only. The number of hours a learner needs to achieve the qualification may vary according to local practice and their previous experience of the subject.

Availability and timetables

All Cambridge schools are allocated to one of six administrative zones. Each zone has a specific timetable. This syllabus is **not** available in all administrative zones. To find out about availability check the syllabus page at www.cambridgeinternational.org/5038

You can view the timetable for your administrative zone at www.cambridgeinternational.org/timetables

You can enter candidates in the November exam series.

Check you are using the syllabus for the year the candidate is taking the exam.

Private candidates cannot enter for this syllabus.

Combining with other syllabuses

Candidates can take this syllabus alongside other Cambridge International syllabuses in a single exam series. The only exceptions are:

- Cambridge IGCSE™ Agriculture (0600)
- syllabuses with the same title at the same level.

Cambridge O Level, Cambridge IGCSE and Cambridge IGCSE (9–1) syllabuses are at the same level.

Making entries

Exams officers are responsible for submitting entries to Cambridge International. We encourage them to work closely with you to make sure they enter the right number of candidates for the right combination of syllabus components. Entry option codes and instructions for submitting entries are in the *Cambridge Guide to Making Entries*. Your exams officer has a copy of this guide.

Exam administration

To keep our exams secure, we produce question papers for different areas of the world, known as administrative zones. We allocate all Cambridge schools to one administrative zone determined by their location. Each zone has a specific timetable. Some of our syllabuses offer candidates different assessment options. An entry option code is used to identify the components the candidate will take relevant to the administrative zone and the available assessment options.

Support for exams officers

We know how important exams officers are to the successful running of exams. We provide them with the support they need to make your entries on time. Your exams officer will find this support, and guidance for all other phases of the Cambridge Exams Cycle, at www.cambridgeinternational.org/eoguide

Retakes and carrying forward marks

Candidates can retake the whole qualification as many times as they want to. Information on retake entries is at www.cambridgeinternational.org/entries

Candidates cannot resubmit, in whole or in part, coursework from a previous series. To confirm if an option is available to carry forward marks for this syllabus, refer to the *Cambridge Guide to Making Entries* for the relevant series. Regulations for carrying forward internally assessed marks can be found in the *Cambridge Handbook* for the relevant year at www.cambridgeinternational.org/eoguide

Equality and inclusion

We have taken great care to avoid bias of any kind in the preparation of this syllabus and related assessment materials. In our effort to comply with the UK Equality Act (2010) we have taken all reasonable steps to avoid any direct and indirect discrimination.

The standard assessment arrangements may present barriers for candidates with impairments. Where a candidate is eligible, we may be able to make arrangements to enable that candidate to access assessments and receive recognition of their attainment. We do not agree access arrangements if they give candidates an unfair advantage over others or if they compromise the standards being assessed.

Candidates who cannot access the assessment of any component may be able to receive an award based on the parts of the assessment they have completed.

Information on access arrangements is in the *Cambridge Handbook* at www.cambridgeinternational.org/eoguide

Language

This syllabus and the related assessment materials are available in English only.

After the exam

Grading and reporting

Grades A*, A, B, C, D or E indicate the standard a candidate achieved at Cambridge O Level.

A* is the highest and E is the lowest. 'Ungraded' means that the candidate's performance did not meet the standard required for grade E. 'Ungraded' is reported on the statement of results but not on the certificate.

In specific circumstances your candidates may see one of the following letters on their statement of results:

- Q (PENDING)
- X (NO RESULT).

These letters do not appear on the certificate.

On the statement of results and certificates, Cambridge O Level is shown as GENERAL CERTIFICATE OF EDUCATION (GCE O LEVEL).

How students and teachers can use the grades

Assessment at Cambridge O Level has two purposes:

- to measure learning and achievement

The assessment:

- confirms achievement and performance in relation to the knowledge, understanding and skills specified in the syllabus, to the levels described in the grade descriptions.

- to show likely future success

The outcomes:

- help predict which students are well prepared for a particular course or career and/or which students are more likely to be successful
- help students choose the most suitable course or career.

Grade descriptions

Grade descriptions are provided to give an indication of the standards of achievement candidates awarded particular grades are likely to show. Weakness in one aspect of the examination may be balanced by a better performance in some other aspect.

Grade descriptions for Cambridge O Level Agriculture will be published after the first assessment of the syllabus in 2023. Find more information at www.cambridgeinternational.org/5038

Changes to this syllabus for 2023

We have updated the look and feel of this document. The subject content remains the same.

Minor changes to the wording of some sections have been made to improve clarity.

There are no significant changes which affect teaching.

You must read the whole syllabus before planning your teaching programme.

Cambridge Assessment International Education
The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA, United Kingdom
Tel: +44 (0)1223 553554 Fax: +44 (0)1223 553558
Email: info@cambridgeinternational.org www.cambridgeinternational.org

Copyright © UCLES September 2020