

International General Certificate  
of Secondary Education

**Syllabus**

AGRICULTURE 0600

For examination in November 2010

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# Agriculture

## Syllabus code: 0600

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### Notes

#### **Conventions (e.g. signs, symbols, terminology and nomenclature)**

Syllabuses and question papers will conform with generally accepted international practice. In particular, attention is drawn to the following documents, published in the UK, that will be used as guidelines:

(a) Reports produced by the Association for Science Education (ASE):

*SI Units, Signs, Symbols and Abbreviations* (1981),

*Chemical Nomenclature, Symbols and Terminology for use in School Science* (1985),

*Signs, Symbols and Systematics: The ASE Companion to 16-19 Science* (2000).

(b) Report produced by the Institute of Biology (in association with the ASE):

*Biological Nomenclature, Standard terms and expressions used in the teaching of biology* (2000).

This syllabus is examined in November only.

It is intended that, in order to avoid difficulties arising out of the use of l as the symbol for litre, usage of dm<sup>3</sup> in place of l or, usually litre will be made. The word litre may be used where, for example in representing agricultural chemical packaging, litre would normally appear.

### Exclusions

This syllabus must not be offered in the same session with the following syllabus:

5038 Agriculture



## INTRODUCTION

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International General Certificate of Secondary Education (IGCSE) syllabuses are designed as two-year courses for examination at age 16-plus.

All IGCSE syllabuses follow a general pattern. The main sections are:

- Aims
- Assessment Objectives
- Assessment
- Curriculum Content.

The IGCSE subjects have been categorised into groups, subjects within each group having similar Aims and Assessment Objectives.

Agriculture falls into Group III, Science, of the International Certificate of Education (ICE) subjects.

## AIMS

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The aims of the syllabus are similar for all students. The aims of Agriculture have been amplified to take account of the particular nature of agricultural practises. These are set out below and describe the educational purposes of a course in Agriculture for the IGCSE examination. They are not listed in order of priority.

The aims are to:

1. promote an appreciation of Agriculture as an applied science;
2. stimulate an interest in, and create an awareness of, existing problems and opportunities in agricultural and rural development;
3. stimulate positive attitudes by showing that farming can be both a beneficial and a rewarding occupation;
4. develop initiative, self-reliance, resourcefulness, problem-solving abilities, scientific methods and self-education;
5. develop scientific attitudes such as accuracy and precision, objectivity, integrity, enquiry, initiative and inventiveness;
6. encourage the teaching, in a practical manner, of basic principles and skills in Agriculture, and of efficient farm business management;
7. demonstrate the value of Agriculture to the family and community, and to show how improved Agriculture can contribute to the world-wide campaign for freedom from hunger;
8. provide an important element, together with the basic sciences and mathematics, in the background required for more advanced studies in Agriculture;
9. ensure that schools take an active part in rural development by the integration of agricultural activities into the school curriculum;
10. develop a school farm or a small-holding and ensure that students actively participate in farming the small-holding throughout the course.

## ASSESSMENT OBJECTIVES

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The assessment will include, wherever appropriate, personal, social, environmental, economic and technological applications of Agriculture in modern society.

The three assessment objectives in Agriculture are:

- A Knowledge with understanding
- B Handling information and solving problems
- C Practical skills and abilities

A description of each assessment objective follows.

### A KNOWLEDGE WITH UNDERSTANDING

Students should be able to demonstrate agricultural knowledge and understanding in relation to the use of:

1. language: terms, symbols, quantities and units;
2. facts, concepts, principles, patterns, models and theories;
3. the techniques, procedures and principles of safe agricultural practice.

### B HANDLING INFORMATION AND SOLVING PROBLEMS

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

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

### C PRACTICAL SKILLS AND ABILITIES

Students should be able to:

1. use and organise techniques, apparatus and materials;
2. make and record observations and measurements;
3. interpret and evaluate experimental observations and data;
4. plan investigations (and, where appropriate, make predictions and propose hypotheses).

### SPECIFICATION GRID

The approximate weightings allocated to each of the assessment objectives in the assessment model are summarised in the table below.

Assessment Objective	Weighting
A Knowledge with understanding	45% (not more than 25% recall)
B Handling information and solving problems	25%
C Practical skills and abilities	30%

# ASSESSMENT

## **Scheme of assessment**

All candidates must enter for three Papers. These will be Paper 1, **one** from either Paper 2 or Paper 3, and **one** from either Paper 4 or Paper 5.

Candidates who have only studied the Core curriculum or who are expected to achieve a D or below should be entered for Paper 2.

Able candidates who have also studied the Extended curriculum should be entered for Paper 3.

All candidates must take a practical paper, chosen from Paper 4, Practical Exercises, or Paper 5, Project Work.

<i>Core curriculum</i> Grades C to G available	<i>Extended curriculum</i> Grades A* to G available
<p><b>Paper 1</b> (45 minutes)  <b>Compulsory</b> multiple choice paper. Forty items of the four-choice type, designed to discriminate between grades C to G. The questions, targeted at the lower grades, will be based on the Core curriculum and will test skills mainly in Assessment Objectives A and B.                      This paper will be weighted at 25% of the final total available marks.</p>	
<p><b>Either</b>  <b>Paper 2</b> (1 hour 15 minutes)                      Core theory paper consisting of 80 marks of short-answer and structured questions, designed to discriminate between grades C to G.                      The questions will be based on the Core curriculum and will test skills mainly in Assessment Objectives A and B.                      This Paper will be weighted at 45% of the final total available marks.</p>	<p><b>Or</b>  <b>Paper 3</b> (1 hour 15 minutes)                      Extended theory paper consisting of 80 marks of short-answer and structured questions, designed to discriminate between grades A to C.                      The questions are targeted at the higher grades and will test skills mainly in Assessment Objectives A and B. A quarter of the marks available will be targeted at the lower grades and contain core only material. The remainder will be targeted at higher grades and will contain material from the supplement.                      This Paper will be weighted at 45% of the final total available marks.</p>
<p><b>Practical Assessment</b>  <b>Compulsory</b> The purpose of this component is to test appropriate skills in Assessment Objective C. Candidates will not be required to use knowledge outside the Core curriculum. Candidates must be entered for one of the following:                      Either <b>Paper 4</b> Practical Exercises (50 marks) (school-based assessment of practical skills)*                      Or <b>Paper 5</b> Project Work (50 marks) (school-based assessment of project work)*                      The practical assessment will be weighted at 30% of the final total available marks.</p>	

\*Teachers may not undertake school-based assessment without the written approval of CIE. This will only be given to teachers who satisfy CIE requirements concerning moderation and they will have to undergo special training in assessment before entering candidates.

CIE offers schools in-service training in the form of courses held at intervals in Cambridge and elsewhere or via Distance Training Packs.

# CURRICULUM CONTENT

Note:

1. The curriculum content outlined below is designed to provide guidance to teachers as to what will be assessed in the overall evaluation of the student. It is not meant to limit, in any way, the teaching programme of any particular school.
2. The curriculum content is set out in three columns. The main topic areas and concepts are indicated in the left-hand column. The centre column provides amplification of the core topics, which all students are to study. Topics in the right-hand column are supplementary and must be studied by students following the extended curriculum.

TOPIC/CONCEPT	CORE	SUPPLEMENT
	<i>All students should be able to:</i>	<i>In addition to what is required in the Core, students following the Extended Curriculum should be able to:</i>
<b>SECTION 1 – GENERAL AGRICULTURE</b>		
<b>1.1 Importance of agriculture</b>	<ul style="list-style-type: none"> <li>- describe the contribution of agriculture to the family, the national economy and world trade</li> <li>- state the major uses of livestock kept by Man, including:                             <ul style="list-style-type: none"> <li><i>non-ruminants</i>: horses, donkeys, pigs and rabbits</li> <li><i>ruminants</i>: cattle, sheep and goats</li> <li><i>poultry</i>: chickens, ducks, geese and turkeys</li> <li><i>fish</i>: tilapia or carp or trout</li> </ul> </li> </ul>	
<b>1.2 Environmental influences</b>	<ul style="list-style-type: none"> <li>- describe the effects of the following environmental factors on agriculture:                             <ul style="list-style-type: none"> <li><i>temperature</i> - its effects on plant growth</li> <li><i>evaporation</i> - wilting of crops due to the rate of evaporation exceeding the rate of water uptake</li> <li><i>humidity</i> - its effects on the rate of water loss from plants and as a factor in fungal disease attack</li> <li><i>rainfall</i> - the variation in distribution, effectiveness, reliability and intensity; the water cycle</li> <li><i>wind</i> - its effects on rate of evaporation and water loss, soil erosion and physical damage to plants</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- describe the functions of catchment areas, groundwater resources and the importance of water conservation, including the processes of mulching and minimum tillage</li> </ul>
<b>1.3 General principles of land use</b>	<ul style="list-style-type: none"> <li>- describe the main features of land tenure systems, rented land, leasehold, freehold and communal tenure</li> <li>- describe methods of land use, shifting cultivation, settled arable cultivation, unenclosed and enclosed grazing systems</li> <li>- describe and explain the effects on agriculture of rotations, mixed farming, organic farming and monoculture</li> <li>- recognise that increases in population size lead to a need for the efficient use of land</li> </ul>	<ul style="list-style-type: none"> <li>- explain how the use of land is limited by the potential for cultivation and by environmental factors</li> <li>- appreciate that the demands of food production may conflict with long-term stability of the environment</li> </ul>



TOPIC/CONCEPT	CORE	SUPPLEMENT
	<i>All students should be able to:</i>	<i>In addition to what is required in the Core, students following the Extended Curriculum should be able to:</i>
<b>SECTION 2 - CROP HUSBANDRY</b>		
<b>2.1 Soils</b>		
The following interrelated aspects of soil science should be studied:		
2.1.1 Soil formation	- describe the ways in which parent rock undergoes physical and chemical weathering and the ways in which organisms contribute to the formation of soil	
2.1.2 Soil profile	- identify a simple soil profile in terms of top soil, sub-soil and underlying material	
2.1.3 Soil texture	- recognise the different sizes of soil particles in terms of sand, silt and clay	
2.1.4 Soil composition	- recognise and describe the components of different types of soil in terms of sand, silt, clay, dead organic matter, air, water and living organisms - explain what is meant by <i>soil crumb</i>	
2.1.5 Soil types	- describe the main characteristics of clay soils, sandy soils and loam soils in terms of particle size, pore space, water retention, temperature, cultivation and plant growth	
2.1.6 Soil fertility	- list the major plant nutrients: nitrogen, phosphorus and potassium; understand the general effects of these nutrients and the need for calcium, magnesium and sulphur - state <b>one</b> organic and <b>one</b> inorganic source of each of the above major elements - describe the nitrogen cycle, without reference to specific named microorganisms - describe and carry out a simple test to determine soil pH - state the factors affecting soil pH and explain their effects on the soil - describe how soil pH can be regulated by the use of lime	- recognise the effects of the overuse of fertilisers - explain the significance of legumes in maintaining soil fertility - relate soil pH to soil types and plant growth - recognise the effect of pH as a limiting factor in crop growth
2.1.7 Soil erosion and soil conservation	- describe the causes of soil erosion and the methods used to reduce soil erosion	
2.1.8 Drainage	- describe how soil is drained by means of ditches and pipe drains	- define <i>leaching</i> - discuss the effect of leaching on the loss of plant nutrients
2.1.9 Irrigation	- describe the ways in which crops can be irrigated	- discuss the effects of irrigation on crop yield and quality
<b>2.2 Principles of plant growth</b>	- define <i>osmosis</i> as the movement of water molecules from a region of their higher concentration to a region of their lower concentration through a partially permeable membrane	- understand the concepts of turgor and plasmolysis

TOPIC/CONCEPT	CORE	SUPPLEMENT
	<i>All students should be able to:</i>	<i>In addition to what is required in the Core, students following the Extended Curriculum should be able to:</i>
<b>2.2 Principles of plant growth (cont.)</b>	<ul style="list-style-type: none"> <li>- describe the way in which water passes from the soil into plant roots and its movement throughout the plant by vascular tissues in terms of the structure and function of root tissues, root hairs and water potential</li> <li>- define <i>diffusion</i> as the movement of ions and molecules from a region of their higher concentration to a region of their lower concentration down a concentration gradient</li> <li>- describe the ways in which mineral salts are taken up by plants in terms of diffusion and active transport and the movement of mineral salts by xylem vessels</li> <li>- describe the absorption of carbon dioxide by leaves in terms of their internal structure and gaseous exchange through stomata</li> <li>- describe photosynthesis in terms of carbon dioxide, water, light, chlorophyll, leaf structure and the synthesis of carbohydrate and the production of oxygen</li> <li>- define <i>respiration</i> as the release of energy from food substances in living cells with the release of carbon dioxide</li> <li>- define <i>translocation</i> in terms of the movement of synthesised food to wherever it is required in the plant</li> <li>- describe the principle of modification of different parts of plants to form food storage organs and the types of food stored</li> <li>- describe transpiration in terms of water loss from the aerial parts of plants and the continuity of xylem in root, stem and leaf</li> <li>- define <i>sexual reproduction</i></li> <li>- identify from specimens and diagrams the structure of the flower of a maize plant and a bean plant and describe the functions of the various parts in sexual reproduction</li> <li>- define <i>pollination</i></li> <li>- describe the mechanism of pollination in maize (wind pollination) and bean (insect pollination)</li> <li>- define <i>fertilisation</i></li> <li>- describe the process of fertilisation in a <b>named</b> plant</li> <li>- define <i>asexual reproduction</i></li> <li>- describe the process of asexual reproduction in Irish potato (<i>Solanum tuberosum</i>) and in sweet potato (<i>Ipomoea batatas</i>)</li> </ul>	<ul style="list-style-type: none"> <li>- describe translocation of applied chemicals including systemic pesticides</li> <li>- relate food storage to a local example of a fruit and a vegetable crop</li> <li>- explain the function of the transpiration stream in terms of the loss of water by evaporation and the diffusion of water vapour through stomata</li> </ul>

TOPIC/CONCEPT	CORE	SUPPLEMENT
	<i>All students should be able to:</i>	<i>In addition to what is required in the Core, students following the Extended Curriculum should be able to:</i>
<b>2.3 Crop production</b>		
2.3.1 Land reclamation	- describe how land can be reclaimed by stumping, clearing and ploughing	- describe the undesirable effects of deforestation
2.3.2 Cereal and root crop production	- describe and explain the methods employed in the cultivation of <b>one</b> cereal crop grown locally, for example maize, sorghum, millet, rice, oats or wheat, including: <ul style="list-style-type: none"> <li>• soil and climatic requirements</li> <li>• seed bed preparation</li> <li>• sowing or planting time and method</li> <li>• seed rate</li> <li>• complete fertilisers, inorganic manures, organic manures and their rates of application</li> <li>• prevention and control of common pests, weeds and diseases</li> <li>• recognition of crop maturity</li> <li>• harvesting and storage</li> </ul>	- recognise the reasons for the suitability of a cereal crop to local conditions and discuss the choice of suitable cultivars <ul style="list-style-type: none"> <li>- describe and explain the methods employed in the cultivation of <b>one</b> root crop grown locally, for example cassava, yam, Irish potato, sweet potato or carrot, including: <ul style="list-style-type: none"> <li>• soil and climatic requirements</li> <li>• soil preparation</li> <li>• sowing or planting time and method</li> <li>• seed rate</li> <li>• complete fertilisers, inorganic manures, organic manures and their rates of application</li> <li>• prevention and control of common pests, weeds and diseases</li> <li>• recognition of crop maturity</li> <li>• harvesting and storage</li> </ul> </li> </ul>
<b>2.4 Crop protection</b>		
2.4.1 Weed control	- identify one <b>named</b> local weed species of a crop - describe its harmful effects and the mode of spread - explain methods of weed control including cultural, mechanical and chemical methods	- discuss the cost-effectiveness of the methods of weed control
2.4.2 Pest control	- describe the mode of attack of <b>one</b> example from <b>each</b> of the following pest types and the nature of the damage caused: <i>biting and chewing pests:</i> including grasshoppers, locusts, termites, leaf miners and beetles <i>piercing and sucking pests:</i> including aphids, mealy bugs and scale insects <i>boring pests:</i> including weevils, stalk borers and American bollworms <i>nematodes</i> (eelworms) - describe <b>one</b> example of <b>each</b> of a chemical and a biological method of controlling <b>named</b> pests	
2.4.3 Disease control	- describe the mode of infection, harmful effects, prevention and control of <b>one</b> plant disease from each of the following groups: <i>bacterial diseases:</i> bacterial wilt of tomatoes, bacterial blight of cotton and bacterial blight of soyabean <i>fungus diseases:</i> damping off of seedlings, downy mildew of peas, rust of carrots, blight of potatoes and powdery mildew of beans <i>viral diseases:</i> tristeza of citrus, tobacco mosaic and rosette of groundnuts	

TOPIC/CONCEPT	CORE	SUPPLEMENT
	<i>All students should be able to:</i>	<i>In addition to what is required in the Core, students following the Extended Curriculum should be able to:</i>
2.4.4 The use of farm chemicals	<ul style="list-style-type: none"> <li>- understand the need, for careful storage and safe handling of dangerous chemicals</li> <li>- explain how chemicals can be stored safely</li> <li>- describe the precautions that should be taken when handling farm chemicals, including:                             <ul style="list-style-type: none"> <li>use of specially designed protective clothing</li> <li>correct dilution and mixing</li> <li>safety measures during application</li> <li>avoidance of pollution when cleaning spraying equipment</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- understand the possible dangers, to human health and the environment, of using chemicals</li> <li>- discuss the advantages and disadvantages of using chemicals to control weeds, pests and diseases</li> </ul>
<b>SECTION 3 - LIVESTOCK HUSBANDRY</b>		
3.1 Livestock anatomy	<ul style="list-style-type: none"> <li>- describe the structure of the digestive system of a ruminant and a non-ruminant animal (<b>not</b> poultry)</li> <li>- describe the reproductive system of a <b>named</b> farm animal (<b>not</b> poultry)</li> </ul>	
3.2 Livestock physiology	<ul style="list-style-type: none"> <li>- describe the processes of digestion and absorption in the alimentary canals of a ruminant and a non-ruminant animal</li> <li>- describe the processes of mating, fertilisation and birth in a <b>named</b> farm animal (<b>not</b> poultry)</li> <li>- define <i>lactation and weaning</i></li> <li>- understand the importance of colostrum</li> </ul>	<ul style="list-style-type: none"> <li>- explain the significance of microorganisms and enzymes in the digestion of a ruminant</li> <li>- discuss the advantage of AI</li> <li>- Explain how breeding cycles can be managed to increase yields from farm animals</li> </ul>
3.3 Livestock health		
3.3.1 Relevant legislation		- explain the principles behind laws relating to notifiable diseases, the importing and exporting of animals and quarantine (obtainable from local Ministry of Agriculture)
3.3.2 Health and disease	<ul style="list-style-type: none"> <li>- recognise the signs of health and ill health of ruminants and poultry</li> <li>- describe the spread of infectious and contagious diseases in ruminants and poultry</li> <li>- explain the importance of livestock hygiene and of the isolation of sick animals</li> </ul>	<ul style="list-style-type: none"> <li>- describe the use of vaccines, sera, antibiotics, antiseptics and disinfectants</li> <li>- describe the veterinary services available locally</li> </ul>
3.4 Livestock nutrition	<ul style="list-style-type: none"> <li>- describe and explain:                             <ul style="list-style-type: none"> <li>the nutritional requirements of animals</li> <li>food materials suitable for the different classes of livestock and their nutritional content</li> <li>feeding practices: including the importance of a balanced ration, maintenance and production rations and the importance of adequate water supplies</li> </ul> </li> </ul>	- describe and explain the suitability of the ration to the age and stage of development of the livestock
3.5 Livestock breeding		
3.5.1 Monohybrid inheritance	<ul style="list-style-type: none"> <li>- define the following terms: <i>chromosome; gene; allele; homozygous; heterozygous; dominant and recessive;</i></li> <li>- calculate and predict the results of simple genetic crosses involving 1 : 1 and 3 : 1 ratios</li> </ul>	
3.5.2 Selection	- understand the role of artificial selection in the production of improved varieties of animals and plants of economic importance	<ul style="list-style-type: none"> <li>- explain the meaning of <i>genotype</i> and <i>phenotype</i> and assess their importance in plant and animal breeding</li> <li>- describe how breeding can improve yield, disease resistance, hardiness, and appearance in <b>named</b> livestock and crops</li> </ul>

TOPIC/CONCEPT	CORE	SUPPLEMENT
	<i>All students should be able to:</i>	<i>In addition to what is required in the Core, students following the Extended Curriculum should be able to:</i>
<b>3.6 Pasture and range management</b>		
3.6.1 Extensive management methods	- describe the vegetation of grazing lands, including grasses and legumes for grazing and bushes for browsing	- describe local species of grass and other pasture plants, their propagation and establishment - describe the value of non-grass species
3.6.2 Intensive management methods	- describe stocking rates, carrying capacity and the dangers of overstocking - describe the improvement of pastures by use of fertilisers, lime and drainage  - explain improved utilisation of pastures by grazing control with reference to rotational grazing, paddock grazing, zero grazing and free range grazing	- describe the use of herbicides, their advantages and disadvantages
<b>SECTION 4 – FARM STRUCTURE AND MACHINERY</b>		
<b>4.1 Fencing</b>	- describe: the materials available for fencing, their advantages, disadvantages and cost treatment of fencing posts methods of fence construction	- describe: types of fence for different purposes hedges and wind-breaks
<b>4.2 Farm buildings</b>	- describe: the materials available for building, properties and uses of wood, concrete blocks, metal, stone, brick, earth and thatch methods of making earth and concrete blocks, concrete floors and roof trusses that are structurally strong and serviceable	- compare the costs of structures made from different materials  - describe site selection and preparation for building
<b>4.3 Farm water supplies</b>	- describe: sources of water for human consumption, for livestock and for irrigation storage dams, including suitable methods of construction to resist water pressure, which increases with depth storage tanks suitable for farm use  - explain: the distribution of water through pipe systems simple plumbing methods used to maintain a plastic pipe system, including pipe-joining and fitting of tap washers	- explain water treatment by settling and filtration
<b>4.4 Farm tools</b>	- understand the use and maintenance of saw, hammer, screwdriver, file, spanner, sprayers and hand tools for cultivation  - understand the use of ropes for securing loads, including methods of tying down a load, using light knots that are easily loosened when the load is to be removed	
<b>4.5 Intermediate technology</b>	- explain the structure and mode of operation of the following mechanical devices and farm structures: <b>mechanical devices</b> trailer pump for raising water <b>farm structures</b> livestock house gate	- understand the value to the farmer of low cost mechanised devices and farm structures that improve upon traditional methods, but require no advanced technical knowledge

TOPIC/CONCEPT	CORE	SUPPLEMENT
	<i>All students should be able to:</i>	<i>In addition to what is required in the Core, students following the Extended Curriculum should be able to:</i>
<b>SECTION 5 – AGRICULTURAL ECONOMICS</b>		
<b>5.1 Principles of economics</b>	<ul style="list-style-type: none"> <li>- explain the following principles: supply and demand; diminishing returns; opportunities and choices facing the farmer; decision-making based on understanding of economic factors</li> </ul>	
<b>5.2 Farm records and accounts</b>	<ul style="list-style-type: none"> <li>- understand how to keep farm records</li> </ul>	<ul style="list-style-type: none"> <li>- understand and explain financial accounts relating to farming enterprises, for example, crop production, including inputs and yields, costs and returns, and calculating profit and loss</li> </ul>
<b>5.3 Farm budgeting</b>		<ul style="list-style-type: none"> <li>- state types of information for budgeting including prices of inputs and outputs and expected yields</li> <li>- explain the preparation of budgets as an aid to planning and control</li> </ul>

# ASSESSMENT CRITERIA FOR COURSEWORK (SCHOOL-BASED ASSESSMENT)

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## 1. INTRODUCTION TO PAPER 4 AND TO PAPER 5

- 1.1 Paper 4 is a continuous assessment of the student's practical work.  
Paper 5 is a teacher-assessed project that must be the sole work of the candidate.
- 1.2 The Agriculture teacher, who is responsible for allocating marks, is required to submit the complete schedule of all marks for the purposes of moderation.

## 2. AIMS

- 2.1 The teacher's assessment of practical work should aim at evaluation of skills and abilities essential to the study of Agriculture that are not suitably measured by theory examinations.
- 2.2 50 marks are available for the assessment of practical work during the course. The practical coursework may be assessed by  
*either* Paper 4, Practical Exercises  
*or* Paper 5, Project Work.

## 3. MODERATION

### 3.1 Internal Moderation

When several teachers in a Centre are involved in internal assessments, arrangements must be made within the Centre for all candidates to be assessed to a common standard.

It is essential that, within each Centre, the marks for each skill assigned within different teaching groups (e.g. different classes) are moderated internally for the whole Centre entry. The Centre assessments will then be subject to external moderation.

### 3.2 External Moderation

Individual Candidate Record Cards and Coursework Assessment Summary Forms internally moderated marks for all candidates must be received by CIE no later than 31 October, the instructions for the practical work (for Paper 4) and the schemes of assessment for each assignment or project. Examples of both forms, for both Paper 4 and Paper 5, are shown at the back of this syllabus. If there are ten or fewer candidates, all the coursework that contributed to the final mark for all the candidates must be sent to CIE. Where there are more than ten candidates, CIE will select the candidates whose coursework is required. CIE will communicate the list of candidates to the Centre, and the Centre should despatch the work of these candidates to CIE immediately.

Further information about external moderation may be found in the Handbook for Centres and the Administrative Guide for Centres.

A further sample may be required. All records and supporting written work should be retained until after publication of results.

## 4. PAPER 4 – PRACTICAL EXERCISES (50 marks)

- 4.1 The Agriculture teacher is required to assess the practical work carried out by students. This entails keeping a record for all the students, showing the operations carried out and the marks awarded.

Much essential 'field-work' in Agriculture has no written component but, clearly, credit should be given for practical ability. At least one discrete practical exercise involving assessment objective C should be assessed in **each** of five terms. Each practical exercise should be assessed according to the criteria stated in Section 4.3.

**4.2 Examples of tasks suitable for the assessment of practical work**

Vegetable production, animal husbandry, soil and crop husbandry offer many opportunities to assess the students' practical work.

The following are a few examples, as a guide to the teacher:

- digging and preparation of a rough tilth
- preparation of a seed bed
- 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
- care of livestock, including: routine hygiene measures (clean water, feed, removal of litter)
- maintenance of cages, pens, nest-boxes, in clean and tidy condition
- slaughtering and dressing chickens

**4.3 Criteria for the assessment of practical work**

The following five criteria should be assessed and marked out of a maximum mark of five.

1. Responsibility -the ability to assume responsibility for the task in hand, and to work from given instructions without detailed supervision and help
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. Technique -the ability to tackle a practical task in a methodical, systematic way, and to handle tools skilfully and to good effect
4. Perseverance -the ability to see a task through to a successful conclusion with determination and sustained effort
5. Quality -the ability to attend to detail, so that the work is well finished and is well presented

The final mark for Paper 4 should be scaled to a maximum of 50 marks (i.e. marks out of 125 should be scaled to a mark out of 50 in the following way  $\left(\frac{\text{mark out of 125}}{125}\right) \times 50$ ).

**4.4 Guide for marking the practical work criteria**

1. Responsibility

<ul style="list-style-type: none"> <li>- follows written or verbal instructions without the need for help</li> <li>- carries out appropriate safety procedures</li> <li>- assumes responsibility easily and leads in group work</li> </ul>	} 5 4
<ul style="list-style-type: none"> <li>- follows written or verbal instructions with a little help</li> <li>- is aware of the need for safety procedures but has difficulty recognising them without guidance</li> <li>- shows responsibility for the work</li> </ul>	} 3 2
<ul style="list-style-type: none"> <li>- follows written or verbal instructions with considerable help</li> <li>- shows little regard for safety procedures, even when told</li> <li>- shows some responsibility for the work</li> </ul>	} 1 0



2. Initiative

<ul style="list-style-type: none"> <li>- offers solutions or explanations to unexpected problems</li> <li>- recognises, and is able to anticipate, problems</li> <li>- solves problems without help</li> <li>- comments on imperfections of experimental methods or results</li> </ul>	} 5 4
<ul style="list-style-type: none"> <li>- offers solutions or explanations to unexpected problems after seeking advice</li> <li>- solves problems with help</li> <li>- recognises faults in experimental methods, given some pointers</li> </ul>	} 3 2
<ul style="list-style-type: none"> <li>- is uncertain how to proceed and requires considerable help</li> <li>- recognises only the most obvious errors in experimental methods after considerable guidance</li> </ul>	} 1 0

3. Technique

<ul style="list-style-type: none"> <li>- approaches tasks methodically and systematically</li> <li>- handles tools/apparatus skilfully and confidently</li> <li>- carries out practical procedures with dexterity</li> </ul>	} 5 4
<ul style="list-style-type: none"> <li>- handles tools/apparatus effectively</li> <li>- carries out practical procedures adequately</li> </ul>	} 3 2
<ul style="list-style-type: none"> <li>- handles tools/apparatus clumsily</li> <li>- carries out practical procedures with difficulty</li> </ul>	} 1 0

4. Perseverance

<ul style="list-style-type: none"> <li>- completes all the required practical tasks and attendant written work</li> <li>- has a positive attitude and is well motivated</li> <li>- carries out repetitive procedures willingly</li> </ul>	} 5 4
<ul style="list-style-type: none"> <li>- completes the required practical tasks and attendant written work with a little encouragement</li> <li>- carries out repetitive procedures willingly</li> </ul>	} 3 2
<ul style="list-style-type: none"> <li>- does not complete the required practical tasks and attendant written work</li> <li>- is somewhat disinterested/impatient when carrying out work and is disinclined to repeat procedures</li> </ul>	} 1 0

5. Quality

<ul style="list-style-type: none"> <li>- performs practical work thoroughly, pays attention to detail and produces a very good final result</li> <li>- produces accurate, clear and neatly presented written work</li> </ul>	} 5 4
<ul style="list-style-type: none"> <li>- performs practical work thoroughly for the most part and produces a satisfactory to good final result</li> <li>- produces mostly accurate and clearly presented written work</li> </ul>	} 3 2
<ul style="list-style-type: none"> <li>- performs practical work in a rushed and superficial way and shows little concern for the finished product</li> <li>- produces inaccurate and poorly presented written work</li> </ul>	} 1 0

## 5. PAPER 5 – PROJECT WORK (50 MARKS)

5.1 The students will carry out and write a detailed report, not exceeding 2500 words, on **one** practical project based on livestock or crops or machinery.

The teacher should evaluate and mark the project and award an overall mark out of 50.

### 5.2 The type of work required

The main thing about project work is that it should be done by the individual student, in connection with some particular study problem. It should not be confused with the writing up of class work exercises.

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

- (a) The work must be investigatory. The student must find the information for himself/herself by direct observation and measurement. Reference may be made to books for background information but, where this is done, all sources must be quoted.
- (b) Though the programme of study must be carried out by the student, it is the responsibility of the teacher to guide the student, or even to select problems that suit the student's investigatory abilities. The teacher may also suggest methods of investigation that are likely to be effective. Students are not research workers, but they can learn how to carry out investigations for themselves, when given appropriate guidance.
- (c) The nature of the problem to be investigated should be stated and discussed by the student in the introduction to the account.
- (d) Time allocated to project work should be approximately 12 periods of 40 minutes, including homework. This should be enough to achieve a good standard. Students should be discouraged from spending so much time on their projects that their normal classwork suffers.
- (e) It is not expected that students will necessarily solve all the problems they tackle, but they should make a worthwhile attempt to do so. When problems fail to yield positive results, the students should be encouraged to discuss their actual findings and comment on the implications. Good project work by students often leads them to understand the difficulties and subtleties of the problem and this can be very educational. For some students, negative results can be depressing, and teachers must use their judgement when guiding them, so that they do not become discouraged. Detailed guidance for teachers is given in the Distance Training Pack.

### 5.3 Examples of acceptable project work

Project work can be based on a variety of topics. The following examples are intended as a guide, but teachers may wish to help their students to devise projects 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 weight 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 students 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 student'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.

### Field Surveys

- soil erosion and conservation in an area near the school
- cattle tick survey; incidence of ticks on cattle (counts done on selected cows on their regular visits to the dip)
- effects of grass burning; effects on species distribution and population by comparing adjacent areas, burned and not burned
- marketing survey; goods produced by local farmers for sale, where sold, profitability, etc.
- rural homestead survey (probably best done at the student's own homestead); people there, accommodation, crops grown for subsistence and for cash, animals kept, reasons, etc.

In field surveys, the aim is to carry out an information-gathering exercise and to evaluate the findings. Technology of survey employed should be stated (exhaustive, random sampling, etc.) and the results and the conclusions should be well summarised.

#### 5.3.1 ***The degree of guidance by the teacher***

This calls for skill on the part of the teacher. Ideally, the student should be free to choose a topic for the project and to decide on methods used in the investigation. In practice, the student will need help because of inexperience. The teacher should never leave the student in doubt for long about what to do next, so that the student does not lose interest or enthusiasm for the project.

### 5.4 **The layout of the project report**

**Title** The report should bear a clear title. This should appear on the first page, together with the name of the student 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 project, 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 project was carried out should be given.

**Background study** This should provide information about the subject of the study and describe any scientific principles that are involved.

**The main report** The main body of the project report should be clearly divided into appropriate sections, with clear headings. It should give a detailed account, in logical sequence, of the practical work carried out. Data recorded should be compiled in tables or graphs.

**Conclusions and assessments** The conclusions of the report 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.

The help received from other people should be acknowledged.

**5.5 Criteria for the assessment of project work**

The following nine criteria should be assessed and marked out of the maximum marks indicated.

- |  |    |
|--|----|
| 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 background study  | 5  |
| 4. The quality of the practical part of the study  | 5  |
| 5. The handling of evidence  | 5  |
| 6. The ability to make deductions from the evidence or the data acquired   | 10 |
| 7. The ability to assess the limitations of the data and to suggest improvements   | 5  |
| 8. Perseverance in the face of practical difficulties  | 5  |
| 9. The description of the nature of the topic and the problems involved, originality of the approach to practical work (candidate's own work), neatness and presentation | 5  |

**5.6 Guide for marking the project work criteria**

1. The selection of relevant questions (hypothesis) for the investigation

- 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 student	0

2. The planning of the investigation and the principles on which it is based

- project well planned, without guidance, showing evidence that the relevant principles are understood	5
	4
- project adequately planned, with some guidance, relevant principles understood	3
	2
- project plan sketchy, plan produced with considerable guidance or no evidence that principles are understood	1
- project plan provided for the student	0

3. The background study

- background material comprehensive and relevant, bibliography included	5
	4
- background material adequate and mostly relevant	3
	2
- background material limited and mostly relevant	1
	0

4. The quality of the practical part of the study

- tasks carried out systematically, with due regard for safety, accurate observations and records	5
	4
- tasks carried out with an occasional error, some inaccurate observations and records	3
	2
- tasks carried out with considerable help, inaccurate observations and records	1
	0

5. The handling of evidence

- 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, 0 plot, 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
	0

6. The ability to make deductions from the evidence or the data acquired

- comprehensive deductions based on the evidence, conclusions given with reasons	10
- several deductions based on the evidence, conclusions given with reasons	8
- few deductions based on the evidence, one conclusion given	6
- few deductions based on the evidence, no conclusions given	4
- one valid deduction, no elaboration	2
- no deductions	0

7. The ability to assess the limitations of the data and to suggest improvements

- all major limitations identified and assessed	5
	4
- several limitations identified but assessed superficially	3
	2
- one or two limitations identified but not assessed	1
	0

8. Perseverance in the face of practical difficulties

- task completed and procedure modified when unexpected difficulties arose	5
	4
- task completed in all but a few details and responded to unexpected difficulties when given guidance	3
	2
- some parts of the task completed but was unable to respond to unexpected difficulties when given guidance	1
	0

9. The description of the nature of the topic and the problems involved, originality of the approach to practical work (candidate's own work), neatness and presentation

- clear, full description of the aims and nature of the topic, project neat and well presented, layout as required by the syllabus, work original (the candidate's own work)	5
	4
- description of the aims and nature of the topic, project not neat nor well presented or layout not as required by the syllabus, work original (the candidate's own work)	3
	2
- outline only of the aims and nature of the topic, project poorly presented, layout not as required by the syllabus, work original (the candidate's own work)	1
	0

## GRADE DESCRIPTIONS

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The scheme of assessment is intended to encourage positive achievement by all candidates.

**Grade F** candidates must show competence in answering questions based on the Core curriculum.

**Grade C** candidates must show mastery of the Core curriculum.

**Grade A** candidates must show mastery of the Core curriculum and of the Extended curriculum.

Criteria for the standard of achievement likely to have been shown by candidates awarded Grades F, C, and A are shown below.

The standard of achievement required for the award of Grade C, include the criteria for Grade F. Similarly, the standard of achievement required for the award of Grade A include the criteria for Grade C.

A **Grade A** candidate should be able to:

- relate facts to principles and theories and vice versa
- state why particular techniques are preferred for a procedure or operation
- select and collate information from a number of sources and present it in a clear, logical form
- solve problems in situations that may involve a wide range of variables
- process data from a number of sources to identify any patterns or trends
- generate a hypothesis to explain facts, or find facts to support a hypothesis.

A **Grade C** candidate should be able to:

- link facts to situations not specified in the syllabus
- describe the correct procedure(s) for a multi-stage operation
- select a range of information from a given source and present it in a clear, logical form
- identify patterns or trends in given information
- solve a problem involving more than one step, but with a limited range of variables
- generate a hypothesis to explain a given set of facts or data.

A **Grade F** candidate should be able to:

- recall facts contained in the syllabus
- indicate the correct procedure for a single operation
- select and present a single piece of information from a given source
- solve a problem involving one step, or more than one step if structured help is given
- identify a pattern or trend where only minor manipulation of data is needed
- recognise which of two given hypotheses explains a set of facts or data.

It is expected that students will demonstrate a background knowledge of, and/or an increased depth of knowledge, in the following physical, chemical and mathematical concepts and processes.



## PHYSICAL AND CHEMICAL CONCEPTS AND PROCESSES

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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

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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

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These terms will be used by Principal Examiners during the setting of papers. Students should be made aware of the terminology during teaching and practical work.

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).

## 1. Numbers

The decimal point will be placed on the line, e.g. 52.35.

Numbers from 1000 to 9999 will be printed without commas or spaces.

Numbers greater than or equal to 10 000 will be printed without commas. A space will be left between each group of three whole numbers, e.g. 4 256 789.

## 2. 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 are listed below.

N.B. 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)	(no symbol)
	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 are listed below.

energy	kilojoule	kJ
	joule	J
	(calorie is obsolete)	

(c) **Recommended units for area, volume and density are listed below**

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

(d) **Use of Solidus**

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

**3. 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**

(i) 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*  $\text{m s}^{-1}$ .

(ii) The column headings of the table can then be directly transferred to the axes of a constructed graph.

(b) **Graphs**

(i) The independent variable will be plotted on the x-axis (horizontal axis) and the dependent variable plotted on the y-axis (vertical axis).

(ii) Each axis will be labelled with the physical quantity and the appropriate SI unit, e.g. time/min.

(iii) The graph is the whole diagrammatic presentation. It may have one or several curves plotted on it.

(iv) Curves and lines joining points on the graph should be referred to as 'curves'.

(v) Points on the curve should be clearly marked as crosses (x) or encircled dots ( $\odot$ ). 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. Pie charts should preferably contain no more than six sectors.

(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 TERMS USED IN SCIENCE PAPERS

It is hoped that the glossary (which is relevant only to Science subjects) 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 do you understand by/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. The candidate needs to leave the examiner in no doubt **why** something happens.
- 5.(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.
- 6.(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 or 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 how many reasons to give, or how much detail to give for each reason.

## RESOURCE LIST

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The following textbooks may prove useful

- |   |   |
|---|---|
| O. Akinsanmi  | <i>Senior Secondary Agriculture Science</i> (1990)<br>Pearson Education 0582003407  |
| D. Ngugi, P. Karau & W. Nguyo                               | <i>East African Agriculture</i> (Third edition 1990)<br>Macmillan Heinemann Educational Publishing 0333488644   |
| A. King   | <i>Agriculture: An Introduction for Southern Africa</i> (1985)<br>Cambridge University Press 052127317X   |
| M. F. Komolafe, A. A. Adegbola,<br>L. A. Are & T. I. Ashaye | <i>Agricultural Science for West African Schools and Colleges</i><br>(2 <sup>nd</sup> Ed. 1985) Oxford University Press (Nigeria) 0195754921  |
| M. F. Komolafe & D. C. Joy                                  | <i>Agricultural Science for Senior Secondary Schools: Books 1-3</i><br>(1990-92) University Press, Ibadan, Nigeria 9781545860,<br>9781549684, 9782490806  |
| J. Kwarteng & M. Towler                                     | <i>West African Agriculture</i> (1994)<br>Macmillan Heinemann Educational Publishing 0333470303   |
| J. Okorie   | <i>Junior Tropical Agriculture for West Africa: Books 2-3</i> (1985–91)<br>Macmillan Heinemann Educational Publishing (Book 1 not in print<br>at present) 0333359909, 0333326466                  |
| G. Owen   | <i>O Level Agriculture for Central Africa</i> (1984)<br>Pearson Education 0582651034  |
| I. Scoones (Ed.)  | <i>Dynamics and Diversity – Soil Fertility and Farming Livelihoods in<br/>Africa</i> (2001) Earthscan Publications ( <a href="http://www.earthscan.co.uk">www.earthscan.co.uk</a> )<br>1853838209 |

Some helpful websites available at the time of writing

- <http://www-saps.plantsci.cam.ac.uk/> SAPS (Science and Plants for Schools)  
<http://www.bbc.co.uk/schools/gcsebitesize/biology/> GCSE BITESIZE revision in biology  
<http://www.nationalacademies.org/webextra/crops> Technology to Feed the World  
[http://www.learnagriculture.org/html/classroom\\_activities.cfm](http://www.learnagriculture.org/html/classroom_activities.cfm) Minnesota Department of Agriculture - lots of  
different agriculture education materials  
<http://www.michiganfarmbureau.com/php-toolkit/aglinks.php/> links to agriculture education and other sites  
[www.soilassociation.org/sa/saweb.nsf/library?openform](http://www.soilassociation.org/sa/saweb.nsf/library?openform) soil association online library with many different  
resources on organic farming  
<http://www.newforestsproject.com/> New Forests Project  
[www.unl.edu/nac/afnotes/ff-1](http://www.unl.edu/nac/afnotes/ff-1) notes on forestry farming

**AGRICULTURE - Practical Exercises  
Individual Candidate Record Card  
IGCSE**

**Please read the instructions printed overleaf and the General Coursework Regulations before completing this form.**

Centre Number						Centre Name	November	<b>2</b>	<b>0</b>	<b>1</b>	<b>0</b>	
Candidate Number						Candidate Name	Teaching Group/Set					
Brief description of Practical Exercises undertaken						1 Responsibility - following instructions	2 Initiative - coping with problems	3 Technique - tackling tasks systematically and skilfully	4 Perseverance - seeing a task through to the end	5 Quality - attending to detail		
											INITIAL TOTAL (X)	TOTAL MARK (scaled) (X÷125) x 50)
Marks to be transferred to Coursework Assessment Summary Form						(max 25)	(max 25)	(max 25)	(max 25)	(max 25)	(max 125)	(max 50)

## INSTRUCTIONS FOR COMPLETING INDIVIDUAL CANDIDATE RECORD CARDS

1. Complete the information at the head of the form.
2. Mark each Practical Exercise for each candidate according to instructions given in the Syllabus booklet.
3. Enter marks and total marks in the appropriate spaces. Complete any other sections of the form required.
4. Ensure that the addition of marks is independently checked.
5. **It is essential that the marks of candidates from different teaching groups within each Centre are moderated internally.** This means that the marks awarded to all candidates within a Centre must be brought to a common standard by the teacher responsible for co-ordinating the internal assessment (i.e. the internal moderator), and a single valid and reliable set of marks should be produced that reflects the relative attainment of all the candidates in the Coursework component at the Centre.
6. Attach this form to the candidate's Practical Exercises, **and retain until required for external moderation.** Further detailed instructions about external moderation will be sent in early October of the year of the Examination. See also the instructions on the Coursework Assessment Summary Form (0600/04/CW/S/10).
7. Transfer the marks to the Practical Exercises Coursework Assessment Summary Form (0600/04/CW/S/10) in accordance with the instructions given on that document.





## A. INSTRUCTIONS FOR COMPLETING COURSEWORK ASSESSMENT SUMMARY FORMS

1. Complete the information at the head of the form.
2. List the candidates in an order that will allow ease of transfer of information to a computer-printed Coursework mark sheet MS1 at a later stage (i.e. in candidate index number order, where this is known; see item B.1 below). Show the teaching group or set for each candidate. The initials of the teacher may be used to indicate group or set.
3. Transfer each candidate's marks from his or her Individual Candidate Record Card (0600/04/CW//10) to this form as follows:
  - (a) Where there are columns for individual skills or assignments, enter the marks initially awarded (i.e. before internal moderation took place).
  - (b) In the column headed 'Total Mark', enter the total (scaled) mark awarded before internal moderation took place.
  - (c) In the column headed 'Internally Moderated Mark', enter the total (scaled) mark awarded *after* internal moderation took place.
4. Both the teacher completing the form and the internal moderator (or moderators) should check the form to ensure all additions and transcriptions are correct before signing the bottom portion.

## B. PROCEDURES FOR EXTERNAL MODERATION

1. University of Cambridge International Examinations (CIE) sends a computer-printed Coursework mark sheet MS1 to each Centre in early October showing the names and index numbers of each candidate. Transfer the total internally moderated mark for each candidate from the Coursework Assessment Summary Form to the computer-printed Coursework mark sheet MS1.
2. The top copy of the computer-printed Coursework mark sheet MS1 must be despatched in the specially provided envelope to arrive as soon as possible at CIE but no later than 31 October.
3. CIE will select a list of candidates whose work is required for external moderation. As soon as this list is received, send candidates' work with the corresponding Individual Candidate Record Cards, this Summary Form and the second copy of MS1, to reach CIE by 31 October.
4. If there are ten or fewer candidates, all the coursework that contributed to the final mark for all the candidates must be sent to CIE. Where there are more than ten candidates, CIE will select the candidates whose coursework is required.
5. Photocopies of the samples may be sent **but** candidates' original work, with marks and comments from the teacher, is preferred.
6.
  - (a) The pieces of work for each skill should **not** be stapled together, nor should individual sheets be enclosed in plastic wallets.
  - (b) Each piece of work should be clearly labelled with the skill being assessed, Centre name, candidate name, and index number and the mark awarded.
7. CIE reserves the right to ask for further samples of Coursework.

**AGRICULTURE - Project Work  
Individual Candidate Record Card  
IGCSE**

**Please read the instructions printed overleaf and the General Coursework Regulations before completing this form.**

Centre Number					Centre Name		November	<b>2</b>	<b>0</b>	<b>1</b>	<b>0</b>
Candidate Number					Candidate Name		Teaching Group/Set				

Brief description of Project Work undertaken, comments on results, assessment and degree of guidance by teacher, etc.	1 Selection of questions (hypotheses)	2 Plan and principles of investigation	3 Background study	4 Quality of practical part of study	5 Handling of evidence	6 Ability to deduce from data or evidence	7 Ability to assess limitations of data	8 Perseverance in the face of practical difficulties	9 Description of topic, presentation, originality	
Marks to be transferred to Coursework Assessment Summary Form	(max 5)	(max 5)	(max 5)	(max 5)	(max 5)	(max 10)	max 5	(max 5)	(max 5)	TOTAL (max 50)

## INSTRUCTIONS FOR COMPLETING INDIVIDUAL CANDIDATE RECORD CARDS

1. Complete the information at the head of the form.
2. Mark each Project for each candidate according to instructions given in the Syllabus booklet.
3. Enter marks and total marks in the appropriate spaces. Complete any other sections of the form required.
4. Ensure that the addition of marks is independently checked.
5. **It is essential that the marks of candidates from different teaching groups within each Centre are moderated internally.** This means that the marks awarded to all candidates within a Centre must be brought to a common standard by the teacher responsible for co-ordinating the internal assessment (i.e. the internal moderator), and a single valid and reliable set of marks should be produced that reflects the relative attainment of all the candidates in the Coursework component at the Centre.
6. Attach this form to the candidate's Project Work, **and retain until required for external moderation.** Further detailed instructions about external moderation will be sent in early October of the year of the examination. See also the instructions on the Project Work Coursework Assessment Summary Form (0600/05/CW/S/10).
7. Transfer the marks to the Project Work Coursework Assessment Summary Form (0600/05/CW/S/10) in accordance with the instructions given on that document.



## A. INSTRUCTIONS FOR COMPLETING COURSEWORK ASSESSMENT SUMMARY FORMS

1. Complete the information at the head of the form.
2. List the candidates in an order that will allow ease of transfer of information to a computer-printed Coursework mark sheet MS1 at a later stage (i.e. in candidate index number order, where this is known; see item B.1 below). Show the teaching group or set for each candidate. The initials of the teacher may be used to indicate group or set.
3. Transfer each candidate's marks from his or her Individual Candidate Record Card (0600/05/CW/I/10) to this form as follows:
  - (a) Where there are columns for individual skills or assignments, enter the marks initially awarded (i.e. before internal moderation took place).
  - (b) In the column headed 'Total Mark', enter the total mark awarded before internal moderation took place.
  - (c) In the column headed 'Internally Moderated Mark', enter the total mark awarded *after* internal moderation took place.
4. Both the teacher completing the form and the internal moderator (or moderators) should check the form and complete and sign the bottom portion.

## B. PROCEDURES FOR EXTERNAL MODERATION

1. University of Cambridge International Examinations (CIE) sends a computer-printed Coursework mark sheet MS1 to each Centre in early October showing the names and index numbers of each candidate. Transfer the total internally moderated mark for each candidate from the Coursework Assessment Summary Form to the computer-printed Coursework mark sheet MS1.
2. The top copy of the computer-printed Coursework mark sheet MS1 must be despatched in the specially provided envelope to arrive as soon as possible at CIE but no later than 31 October.
3. CIE will select a list of candidates whose work is required for external moderation. As soon as this list is received, send candidates' work with the corresponding Individual Candidate Record Cards, this Summary Form and the second copy of MS1, to reach CIE by 31 October.
4. If there are ten or fewer candidates, all the coursework that contributed to the final mark for all the candidates must be sent to CIE. Where there are more than ten candidates, CIE will select the candidates whose coursework is required.
5. Photocopies of the samples may be sent **but** candidates' original work, with marks and comments from the teacher, is preferred.
6.
  - (a) The pieces of work for each skill should **not** be stapled together, nor should individual sheets be enclosed in plastic wallets.
  - (b) Each piece of work should be clearly labelled with the skill being assessed, Centre name, candidate name, and index number and the mark awarded.
7. CIE reserves the right to ask for further samples of Coursework.