

AGRICULTURE

Paper 0600/01
Multiple Choice

General Comments on 0600/01 Nov 2007

The total number of entries for this multiple choice paper was 3,303. The mean on the paper was 27.3 which was a slight increase from last year. The range of marks obtained by candidates was 11 – 38 which is a significant increase at the bottom mark point and a very marginal decrease at the upper mark point, from last year.

Most candidates found most of the questions accessible and in the vast majority of cases were able to determine the correct key. **Questions 4, 5, 7, 8, 14, 17, 23, 24, 28, 30, 31, 32, 33, 34, 37, 38** and **39** proved to be straight forward for candidates to access the mark and the majority of candidates selected the correct key. However, **Questions 20, 21, 22, 29** and **36** were clearly more challenging and where the majority of candidates selected the wrong key. All these questions covered different parts of the syllabus.

For **Questions 1, 15** and **40**, although the majority of candidates selected the correct key, a significant proportion of candidates chose alternative incorrect keys. Again the syllabus coverage was not limited to one particular area for these questions.

Overall the paper was accessible and helped to differentiate the candidates.

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<p>Paper 0600/02 Core Theory</p>
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General comments

This paper is set as an option to paper 3. It examines the core syllabus and is designed to differentiate between grades G to C. Entries remain low. It appears that Centres are only entering their very weakest candidates. Centres need to check their results closely, for they may find that their projected C/D candidates entered for paper 3 have not achieved their expected grade due to the more demanding style of questions that are asked. Some questions have parts in common, but teachers must bear in mind that Paper 3 is designed to differentiate between the higher grades, and to test the supplement syllabus.

The paper consists of nine structured questions set on topics in the order in which they appear in the syllabus. Each structured question starts with parts aimed at grades G-F, followed by a middle section aimed at F-D. The final part, that includes open-ended responses, is aimed at grades D-C. The command words such as, 'state' and 'list', introduce low-level question parts. 'Suggest' and 'explain' indicate that higher-level answers are required. Diagrams are used to help key candidates into the questions.

Candidates are expected to have practical experience of agriculture and many questions had parts that tested this. **Question 2** tested the pH test and **Question 9** required an understanding of the precautions needed when using a sprayer. Knowledge of farm structures was, again, disappointing. Candidates should be familiar with crop storage buildings such as the one shown in **Question 4**. **Part (a)** in **Question 7** tested knowledge about digestion and achieved good marks, but **part (b)** on genetics and animal breeding was poorly done. **Questions 4, 8** and **9** included some data response, which most candidates attempted, but it must be emphasised that answers should relate to the data given. **Questions 3, 6** and **7** required extended writing and some accounts showed good knowledge and a useful command of English.

Comments on specific questions

Question 1

This question required an appreciation of farming systems and farming methods.

- (a) The definition of 'shifting cultivation' had to include the idea of moving to better land or moving on because current land had become infertile. Moving to new pastures without qualification did not gain the mark.
- (b)(i) The diagram illustrated a settled arable system. The oxen could be used for transport of people or loads. They can also be used for pulling ploughs.
 - (ii) The Leucaena trees act as a wind break which protects the maize. The leaves can be used as green mulch and the wood used for burning. As it is a legume there is bacterial activity in the roots which can eventually lead to increased soil nitrates. Answers that suggested the trees provided shelter and shade for animals were credited. **Part (iii)** required reasons for carrying out mixed farming.
 - (iii) Most candidates were able to indicate the advantage in not having 'all one's eggs in one basket' with regard to production or money. Fewer candidates suggested that mutual benefit could be gained from different crops and animals, for example animals' manure used as fertiliser for crops.

- (c)(i) The expected answer was goats.
- (ii) Crop yield can be increased by using improved varieties, adding more fertiliser and improving pest/disease control. Some candidates suggested intercropping which was credited.

Question 2

- (a) The table proved too difficult for most candidates. Possibly it tested book learning rather than practical experience. The common organic sources of P and K are bone meal and wood ash respectively. An inorganic source of N is ammonium nitrate or LAN (urea was credited) and an inorganic source of K is muriate of potash or potassium nitrate.
- (b) The fact that magnesium is essential to chlorophyll production was not well known. General answers like 'it helps plant / leaf growth' did not get the mark.
- (c)(i) Fig. 2.1 showed random sampling, which is necessary to overcome variation when sampling a large area.
- (ii) The remaining parts tested the way a pH test is carried out. Rain water is not used because it might contain impurities that would affect the result.
- (iii) The pH is found out by using soil (universal) indicator and comparing the result with a colour chart. Using a probe and reading off a meter is an alternative method. Use of litmus paper was not allowed.
- (iv) If the test was carried out shortly after lime was added, the colour would be blue/green or the reading would be higher. The answer had to relate to the test so comments such as 'soil acidity is reduced' were not credited.

Question 3

This question tested knowledge of soil characteristics and it produced a variable response.

- (a) Soil sieves may not have been used by candidates but they should have been able to work out the answers, apart from the mesh size of sieve B.
- (i) The sample needs to be dried before sieving. Wet soil will not pass through sieves as the soil particles would be stuck together.
- (ii) The mesh size of sieve B is 0.2mm.
- (iii) Large soil components such as bits of plant, humus, or even live animals would remain in A.
- (iv) The proportions of the soil fractions in each sieve indicated the sample was sandy loam.
- (b) The features of sandy soils were very well known.
- (c) This followed on from **part (b)** and the better candidates realised that FYM would improve water holding capacity by improving the soil structure. Surprisingly few candidates referred to the fact that FYM would improve fertility.

Question 4

- (a)(i) Most candidates used maize to answer this part. In maize maturity is noted by hardness or colour of the grain and by the browning of the cob.
- (ii) The need for a dry, well ventilated storage place was appreciated by almost all the candidates.

- (b)(i) The inverted cups on the building legs prevent animals, such as rats, climbing up to eat the stored grain, a fact that was known by most candidates.
 - (ii) The disadvantages of using thatch for the roof were also well appreciated. It is not durable can catch fire or be blown off in strong winds. Some mentioned the fact that pests could live in the thatch.
 - (iii) Methods of preserving the wooden house legs were generally known, e.g. setting them in concrete and applying creosote or oil. Use of paint was given credit.
- (c) The meaning of biological control is now well understood. In **part (i)** the example most often quoted was the ladybird eating aphids. Mongoose eating rats was another popular answer. Interpreting data often puts many candidates off, but in this instance most had a go and made an assessment of the effectiveness of different methods of pest control. Chemical spray was the most effective, chemical vapour the least effective and biological was only really useful in controlling aphids.

Question 5

This question related to laboratory biology rather than practical agriculture which put some candidates off.

- (a) Osmosis was the answer required.
- (b) The method shown, that illustrated transpiration, need not have been carried out by the candidates as it tested application of knowledge rather than recall. The water level drops over time and this is increases when a fan blows air over the plant leaves. An explanation as to why this happens was needed in **part (iii)**. This proved difficult. Few appreciated that oil prevents surface evaporation which would affect the accuracy of the results.
- (c) This part linked the process of transpiration to crops in the field. Wilting occurs when water loss exceeds water uptake and practices that ensure this does not happen are irrigation or frequent watering. Planting a wind break was given credit as it does help prevent water loss by the crop. Some did not relate their answers to a field crop.

Question 6

- (a) Y is the gullet or oesophagus.
- (b) This part was well answered. Chewing breaks food into smaller pieces to aid swallowing and enable enzyme action. Some suggested it enabled animals to taste their food. This may be a result of chewing but it is not why animals chew.
- (c) Candidates were aware of the terms 'maintenance' and 'production' when applied to rations, and knew when these rations should be fed, but they did not know how the rations differ. In this case the working donkey needs high carbohydrate for energy, and high protein for muscle which can be obtained by feeding more food or a concentrate ration rather than dried grass.
- (d) Most correctly positioned the wheel just behind the centre of the cart and added hooks, cleats or buckles for rope fastening. The knot most used for securing loads is the slip knot, D as it keeps itself tight against the movements of the load yet can easily be pulled undone.

Question 7

This was the best answered question on the paper.

- (a) The matching of statements was a style of question that was new to this paper. It did not confuse the candidates and most scored high marks.

- (b)(i) The genetic diagram clearly showed the horns absent from the first generation of sheep which indicated that the allele for horns was recessive. There were no marks for stating this without giving a reason.
- (ii) The descriptions of how features are passed from generation to generation were mostly well done. Marks were given for certain 'key' words such as gametes, chromosomes, genes, DNA, etc. when used in meaningful sentences. Marks were not awarded for the words themselves as the question required a description.
- (c)(i) The differences in the two rams were well observed and sensible suggestions were made for them, such as different diet, different genetic make up and different exposure to disease.
- (ii) Ideas for suitable records to keep for lamb production were good. Weight records, growth rates and food conversion were all suggested.

Question 8

This question proved difficult.

- (a)(i) Candidates had to appreciate that the flower was large with stamens enclosed which points to pollination by insects. Some said that the stamens and stigma were close together inside the flower which favoured self pollination. This was given credit.
- (ii) The descriptions of asexual reproduction in the sweet potato were disappointing. Most confined themselves to a general statement such as, 'no gametes needed' or 'potatoes all the same' instead of relating how the potato produced runners, which grew new tubers that eventually become separated as new plants.
- (b) Surprisingly there was more awareness as to why the experiment described was not a fair test, because like was not being compared to like, than there was of why the plants on the frames grew better. This was because they got more access to sun light so photosynthesised more. 'Grew better' did not get credit. Another possible reason was that the ground plants got eaten by ground pests.
- (c) The majority of answers to both parts of this question were superficial. When an explanation is asked for, an unqualified statement such as, 'nitrogen makes leaves greener and larger', does not get credit. Nitrogen is used in making proteins which are used in plant growth. Nitrogen is used to make chlorophyll which promotes photosynthesis which provides sugars that can release energy for growth. The graph illustrated the principle of diminishing returns. Greater fertiliser use and therefore cost does not result in bigger yield and therefore greater profit above a certain critical point. In this case 600 kg/ha per year.

Question 9

- (a)(i) The diagram keyed the candidates into a wide variety of answers. Credit was given for no goggles to protect eyes, no gloves or overalls to protect skin and no mask to protect inhalation.
- (ii) When the sprayer is being cleaned care should be taken that the waste does not enter a water source and the operator should wash his hands on completion of the task. The better candidates realised this.
- (b) Most explanations were superficial. Answers needed to be stated as benefits to the pasture plants and thus reference to more soil organisms in drained pasture resulting in better soil fertility and structure, although true, is not specific to the plants. Plants benefit by receiving more oxygen for root respiration and more warm air to speed up growth processes. One mark was allowed for simple statements like, 'plants do not drown' and, 'plants do not rot'.
- (c) There is a lot of confused thinking about carrying capacity and stocking rate. The former refers to the land - how many animals (LSU) can the pasture support per hectare without deterioration. Stocking rate describes the number of animals (LSU) kept per hectare. In this example 0.2 animals (LSU) are kept on a hectare, in reality one animal on 5 hectares. The carrying capacity is one animal per 12 hectares so this part of Botswana is overstocked.

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Paper 0600/03
Extended Theory

General comments

It was pleasing to note that most candidates attempted and were able to score some marks for every question. Even the weaker candidates were able to score marks. Candidates made good use of the information provided, but when reading graphs it is important to refer to specific points or data on a graph to help secure a mark.

The two areas of the specification that appear to be less well understood are soil pH and testing and genetic crosses in particular phenotype and genotype. A few candidates would have been better advised to take the Core Theory paper.

It was very pleasing to note how candidates use their practical experience of agriculture in answering the questions.

Question 1

- (a) (i) Most candidates were readily able to identify legumes.
- (ii) Most candidates identified nitrogen fixing bacteria but were unable to explain the route by which nitrates are returned to growing crops.
- (b) A wide range of good answers were given and it was possible to credit a variety of different land management techniques suggested by the candidates.
- (c) In general this part was very well answered, although some candidates gave vague descriptions relating to pesticide or fertiliser toxicity. Better candidates briefly described four key points. Candidates demonstrated a sound understanding of soil erosion related to overstocking or inappropriate cultivation techniques.

Question 2

- (a) Almost all candidates were able to identify the soil as sandy or sandy loam.
- (b) Most candidates identified water retention as an effect of the mulch. Some candidates gave very vague responses about improving the soil but with no reference to fertility or soil structure.
- (c) A wide range of answers were given and marks were credited for many different answers including the reduction of labour. A few candidates failed to clearly identify four points. It is important to note that where candidates are asked to discuss the advantages and disadvantages, they must not simply give a range of advantages and disadvantages.

Question 3

- (a) Some candidates found this question quite difficult and were unable to describe a series of stages that would give a correct pH
- (b) (i) This proved to be very difficult. A few candidates saw the significance that nutrients were not available between pH4 and pH6. Credit was given for a pH range of 7.5 and above.
- (ii) A few excellent answers, but few candidates were able to say how H⁺ effects the solubility of nutrients or describe base exchange. The most common correct answer was no or little bacteria action.

Question 4

- (a) (i) Generally well answered although some candidates described non-root crops.
- (ii) Most candidates answered this correctly.
- (b) (i) This was very well answered and it was pleasing to see how many candidates used the diagram to prompt responses.
- (ii) This was also well answered. Candidates clearly understood the importance of materials and their cost effectiveness.

Question 5

- (a) (i) Marks were credited where candidates indicated a lack of water or high temperature which resulted in more water being lost than taken in.
- (ii) Some very vague answers were given with few candidates showing awareness of plasmolysis or the rate of water loss and cell turgor.
- (b) Many candidates understood the cooling effect of water loss and the transportation of mineral salts.
- (c) This question was well answered and marks were given for a wide range of answers including leaf loss and die back.
- (d) (i) Most candidates were able to answer this, although few identified that the levels remained low for 2000.
- (ii) Very few candidates commented on how seeds are able to resist fire and grow back, or that goats destroy both adult and growing bushes.

Question 6

- (a) (i) Generally well answered – most candidates recognising the donkey as a non-ruminant.
- (ii) and (iii) Almost all candidates scored a mark for enzymes being active in the stomach or small intestine, however, micro-organisms were found in many parts of the digestive system, candidates generally being unable to identify the role of the caecum.
- (b) Almost no candidates identified the importance of eating dung to gain micro-organisms for digestion.
- (c) A good range of credit worthy answers were given. Weaker candidates failed to give a reason for high level of an appropriate nutrient.
- (d) (i) Candidates read the graph and were able to identify two differences between the licks.
- (ii) It was pleasing to note how many candidates saw the importance of clay as a binding agent. Some even noted its ability to absorb harmful substances.

Question 7

- (a) Fertilisation was well understood and most candidates understood AI.
- (b) Some candidates confused the terms genotype and phenotype.
To score full marks each relevant box had to be correct.
- (c) (i) This was well answered. Most candidates were able to identify **D** and gave good reasons.
- (ii) Very few candidates identified the need to understand the importance of the bull's parents or the behaviour of progeny.

Question 8

- (a) (i) Most candidates were able to identify the idea of diminishing returns.
- (ii) Few candidates linked the importance of nitrate with the production of amino acids and protein, although quite a few were able to name nitrates in the production of chlorophyll for photosynthesis.
- (b) This was well answered with most candidates able to describe translocation and the reason for storing starch in the tubers.
- (c) Again, this was well answered, although a few candidates identified the use of a trellis to enable plants to obtain more light for photosynthesis.

Question 9

- (a) This question was very well answered.
- (b) (i) Most candidates scored a mark for the correct stocking rate, but did not always link the maximum number able to be stocked without causing damage to the land.
- (ii) The correct answer was overstocked. Few made a numerical reference .
- (c) (i) Almost all candidates were able to describe two services provided by their local vet.
- (ii) Whilst disinfectants and fungicides were well understood, antibiotics were not clearly linked to treating bacterial infection.

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Paper 0600/04

Practical

General comments

Fewer Centres offered this option this year than in previous years. Some Centres entered but submitted work that was clearly projects and so had to be transferred to 0600/05.

Teachers should check the Assessment Criteria, which are included in the current year IGCSE syllabus, before starting to prepare candidates for practical tasks. It is important that teachers are familiar with these criteria, to help them plan graded exercises. It is quite permissible to show candidates the assessment criteria so that they know how they are going to be assessed.

The most common criticism in Centre reports concerns a lack of provision for adequate differentiation. Too many exercises test basic skills only.

The tasks selected for assessment should provide opportunities for candidates from the whole ability range to demonstrate their practical skills. One way of achieving this is to construct worksheets that offer options and extension work. The work is then assessed using mark schemes that recognise different levels of achievement. The mark schemes are needed for external moderation.

Ideally Centres should provide one task from each of the syllabus sections: soil, growing crops, livestock husbandry, farm structures and agricultural economics. Very few Centres do this. A common selection includes a soil test practical, a farm structures activity such as block making and three tasks related to the growing of a crop - seed bed preparation and planting, tending the growing crop with measurements of growth and harvesting with a calculation of yields.

It is not essential to test all candidates on the same exercises. Nor is it essential that every task should be used to assess all of the criteria.

It is important that some of the tasks should generate written work that can be used as proof of individual involvement and provide an indication of quality.

Descriptions of, for instance, how a garden plot is cultivated or how cement blocks are made, are suitable for this purpose. The candidates should refer to any problems encountered in their work and emphasise any safety precautions taken.

Measurements of plant growth and crop yields, or production figures from animals, provide data that can be tabulated and then represented by a graph or pie chart.

Photographs of candidates carrying out tasks are useful evidence of work done.

Internal moderation only needs to be carried out by teachers when there is more than one teaching group in the Centre.

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Paper 0600/05

Project

General comments

This paper continues to attract a small entry of above average candidates world wide.

It is important that teachers new to this component check the Assessment Criteria before starting to prepare candidates for the project. These criteria are included in the current year IGCSE Syllabus.

It is expected that, prior to the selection and carrying out of the project, candidates will have been made aware of the assessment criteria and taught what a hypothesis is, how to design a questionnaire, control variables, collect data and select suitable graphs. The nature of limitations should be discussed and the required layout of the project should be described.

The regulations for this paper allow teachers to monitor candidates' progress and to offer advice. In some assessment criteria the amount of help given will affect the mark awarded. The nature of the help given should be recorded on the individual candidate record card.

Assessment criteria that continue to cause problems are 'planning' and 'limitations'. The plan put forward must enable answers to the questions posed to be found out. It should indicate how variables are to be controlled. It should include a detailed account of the experimental method and the procedures to be followed. Under 'limitations' any flaws in the experimental plan that became apparent should be commented upon, as well as describing the things that went wrong due to unforeseen circumstances and human failings. Suggestions as to how the limitations may be overcome should be put forward.

The presentation of many of the projects was, once again, excellent with many demonstrating good use of computer graphics.

Group projects are quite acceptable but the individual contribution of each candidate has to be assessed. This is made more difficult if the projects are produced on a word processor. It is important in such situations that the teachers monitor each individual's progress, and record marks with explanatory annotation on their record cards. Candidates in group projects should be encouraged to put their own 'stamp' on common sources.

As usual, experimental comparisons provided successful projects. Those involving measuring the growth rate or yield of plants and animals in different situations were popular. Taking measurements of plant growth provides an opportunity to evaluate the significance of different measurements. Length and width of leaves are not good indicators of growth in many plants, height is more significant. Several candidates measured under five leaves, not a sufficient number to produce valid data.

Some good surveys were put forward this year and they achieved a good standard. The topics chosen by the candidates showed a real awareness of Agriculture in the wider context of country and society, for example: AIDS, organic farming and genetically modified food. Candidates must ensure that sufficient questionnaires are completed in order to collect enough data for subsequent analysis. The data from the questionnaires must be tabulated prior to producing pie charts or bar charts.

Internal moderation only needs to be carried out by teachers when there is more than one teaching group in the Centre.

For external moderation, a sample of 10 projects is required - the one awarded the top mark, the one given the lowest mark and others that represent the full spread of marks. It would help handling if projects were presented in plastic binders rather than bulky hard covered ring files.

The annotation by teachers of the candidate record cards is appreciated, and is of great help at external moderation. Comments that indicate how much guidance has been given, and the problems encountered by the candidate help the external Moderator to understand how the marks have been awarded.

With such a small entry the statistics vary considerably from year to year.