

AGRICULTURE

Paper 0600/11

Paper 11

Key Message

Candidates should expect to meet a variety of questions from short objective questions, through structured questions based on a variety of stimulus materials, to questions based on practical contexts and those based on data response as well as essay questions.

It is important that Centres ensure the 'biological' aspects of the Agriculture Syllabus are covered.

General comments

This year was the first time the revised syllabus for 5038 and 0600 was examined.

Candidates are expected to have practical experience of Agriculture and some questions had parts that tested this. For example, **Question 1** tested soil analysis and **Question 2** tested the preparation of a garden plot and the growing of a crop.

The revised exam tested data response, for example **Questions 6, 7 and 8**. The data is designed to be unfamiliar so that the candidates answer from the given data rather than their own knowledge.

Comments on specific questions

Section A

Question 1

- (a) A straight forward objective question requiring the candidates to label the layers in a soil sedimentation experiment. Layer **B**, silt, was wrongly labelled by many candidates as clay.
- (b) The question required candidates to link soil constituents to their role in the soil. Most candidates scored well. The most common mistake was to link microorganisms to improving soil structure.
- (c) Some candidates gained credit for stating that any build up of hydrogen ions in the soil will increase acidity and thus make fewer nutrients available to plants. Lime counteracts this process. Microorganisms are also more active in alkaline soils and this was also credited.

Question 2

- (a) Candidates were shown three tools and had to choose the order in which to use them when preparing a tilth. Most gained credit.
- (b) Although no mark was allocated for naming a crop, by not naming it did disadvantage some candidates when giving details of the fertiliser to be used and the timing of the application. The quality of answers varied considerably – answers that provided correct accurate detail gained most credit. Superficial answers got little or no credit. The types of fertiliser used were well stated but the timing of application was less evident. It was nice to see some candidates referring to 'basal dressing'. Signs that the crop was mature were the least well answered part in the table.
- (c) A description of sexual reproduction in Maize was required and there were some excellent responses. The least well known aspect was the growth of the pollen tube down the style. Many candidates incorrectly stated that the pollen grain itself moved down the style.

Question 3

- (a) The nitrogen cycle was well understood by most candidates. A common mistake was to label the bean plant as the site of nitrifying bacteria.
- (b)(i) Almost all candidates gained credit for correct completion of year 3 in the rotation.
- (ii) The fact that legumes have nitrogen fixing bacteria in their root nodules was well understood but this only benefits the legume. The soil is not improved until the plant with its high nitrogen content decomposes.
- (iii) The main benefit of crop rotation is that soil nutrients are not depleted which was given by some candidates. Most answers gained credit for pest and disease control as another benefit.

Question 4

- (a) An objective question concerning the definition of osmosis which was very well answered.
- (b)(i) Here candidates had to identify the palisade layer and phloem in a leaf. This was again well answered. However, candidates must be told to clearly mark their choice as those putting labels between the position of the phloem and xylem were not given credit.
- (ii) Cell X was correctly identified as a guard cell.
- (c) An open ended question to which candidates responded well. Some desert plants have reduced leaves, other plants have hairs or roll their leaves. An expected response, 'thick cuticle' was not commonly given.

Question 5

- (a)(b) Two multiple choice questions about the spread of disease for which most candidates received full credit.
- (c)(i) The signs of disease are not quite the same as signs of ill health – standing alone. The question, also, did specify what should be looked for when checking the animals; 'not feeding' would not be noticed at a single check. On this occasion these were treated as Additional Valid Points (AVP;) in marking to make sure that candidates were not penalised if English was not their first language.
- (ii) The two actions to be taken if disease is suspected are, isolation and seeking veterinary advice for which many candidates gained credit. Often candidates suggested the disease should be reported, however this is only necessary for notifiable or scheduled diseases.
- (d)(i) The diagrams of the natural and artificially brooded chicks prompted credit-worthy answers.
- (ii) Young animals have not fully developed their immune systems so need a boost. It will also protect them from disease to which they are exposed. The first marking point concerning the young animals was often missed.

Question 6

- (a) Three simple recall question based on a diagram of the ruminant digestive system caused few problems. The purpose of bacterial fermentation - digestion of cellulose - was the least well known of the trio.
- (b) This was largely data analysis as candidates were presented with diagrams of a ruminant and a non ruminant and asked to state two similarities and one difference between them. Some very good observations were evident.
- (c) Far fewer candidates gained credit for the analysis of the given pie chart. Deforestation for 20% was the correct response but the numbers choosing this were matched by those selecting methane from livestock which was 25%.
- (d)(i) The bar chart representing annual methane emissions from livestock yielded more credit-worthy responses.

- (ii) To achieve credit, candidates had to relate the release of methane to a grass diet or the activities of the rumen. 'Pigs eat a lot' was an example of a low level answer that did not gain credit.

Question 7

This question combined data analysis and decision making.

- (a) A multiple choice question on supply and demand that was very well answered.
- (b) Part (i) required a calculation of percentage change the correct answer to which was arable. Many candidates simply gave the largest change, cattle, which was incorrect.

The answers for the next three parts needed to be based on the data for the farm records. These showed that costs for animal feeds will rise and the demand for vegetables and eggs will increase.

The answer to part (ii) was arable as there is no increase in costs and receipts will increase because of the demand for more cabbages.

In part (iii) it was necessary to compare the costs of producing the eggs with the sales. The profit margin would go down because of the increase in feed. Marks were given for the reasons rather than the decision given.

The final part was well answered. Other possible costs included, labour, transport and utilities such as electricity or water.

Question 8

- (a) An objective question requiring candidates to match genetic terms to their definitions. Most answers gained full credit.
- (b)(i) Careless answers lost marks here. Reference had to be made to the fact that the parental black rabbit had two dominant alleles. The answer, 'black rabbit is dominant', a common answer, did not gain credit as it is incorrect, failing to refer to the alleles which the black rabbit has.
- (ii) A standard genetic diagram showing the F_1 offspring with the two possible alleles, the gametes segregating and the resultant 25% brown rabbits appearing in the F_2 gained three marks. Many candidates gained full credit.
- (iii) Partial credit for this part was usually achieved for the selection of long haired rabbits. The need to continue this selection over successive generations for full credit was often missed.
- (c) In part (i) the total mass of rabbits had to be divided by the mass of individual rabbits while realising that the former were listed as kg and the latter given in grams. Only a few candidates gained credit.

In part (ii) there was a general understanding that in weeks 1-3 the young rabbits were suckling from the mother.

Few candidates noticed there was a dip in the weekly feeding intake between week 5 and week 6. so even partial credit was uncommon.

Question 9

- (a)(i)(ii) Two multiple choice questions based on a diagram. The fact that, on livestock houses, thatch provides good insulation and that wire provides ventilation were well appreciated.
- (ii) The advantage of using blocks rather than mud walls for the house was also well understood. Any reference to strength or durability of blocks was given credit.
- (iv) The main advantage of a concrete floor is the ease of cleaning. Marks were allowed for reference to better hygiene and lack of burrowing pests. (However, in the interests of completeness, it should be noted that rats like nothing better than living under a concrete floor.)

- (b)(i) This open ended question was well attempted. Many answers were credited; direction of prevailing wind; orientation to sun; availability of water; nearness to farmhouse; slope and drainage of the site. Credit was not given for nearness to market, rainfall, and size of site,

Section B

This section consisted of five long answer questions. Candidates had to choose two. Some candidates attempted to do them all. This deprives other questions of time which might well have improved them, and should not be done. It is termed a 'rubric error' and was evident in all or most scripts from some Centres which indicates that candidates are being poorly advised on this point.

All the questions had the same format, a definition for two or three marks, a description and an explanation or evaluation. It is important that candidates relate the amount of their answers to the marks stated on the paper. Two sentences will not achieve the seven or eight marks allocated for a description and a detailed half page on a definition will not score more than the maximum stated.

No one question was more popular than another. All questions achieved marks over the whole range and no one question proved to yield less credit than any other.

Question 10

- (a) Soil capping, a syllabus term, was poorly understood and muddled with 'soil pan'.
- (b) Candidates gained credit here with good explanations of physical weathering. Some incorrectly included biological breakdown under this heading.
- (c) This part, too, was well answered, with many candidates gaining credit for their description of a sandy soil.

Question 11

- (a) Mixed farming, a syllabus, term was quite well understood. To get full credit, reference had to be made to the activities being carried out on the same farm.
- (b) Organic crop production is a relatively new practice. Most candidates scored some credit for referring to the use of organic fertiliser or manure. Few candidates developed this to include using biological control for pests and cultural methods such as crop rotation. The maintaining of soil structure is also an important organic requirement and was rarely seen.
- (c) Genetic engineering of crops is quite a new practice and is not covered in many text books but it is widely discussed on the Internet. Some of this information is very alarmist and candidates need to be encouraged to take a balanced view. There are unknown possible health risks and some people may have allergic reactions but GM foods do not 'kill' or 'affect reproduction' as asserted in many scripts. Other valid arguments against are; (i some varieties) seed cannot be saved so expensive each year, market resistance to product and the danger of cross pollinating with native plants. Arguments for may include improved yield, quality, shelf life and disease resistance. Some candidates quoted ethical considerations and these were credited as part of a balanced account.

Question 12

- (a) Zero grazing was well understood by some candidates. Reference to taking hay/silage to the animals was needed for full credit.
- (b) There were some excellent descriptions of preparing ground for a pasture that included tillage, application of fertilisers and planting. The fact that pastures should consist of a mix of quick growing annuals, soil binding perennials and leguminous plants, which add nitrates, was evident in many answers. Some candidates lost credit for describing pastures for hay production linked to zero grazing.
- (c) Candidates are find it easy to explain the disadvantages of intensive grazing, but it proved more demanding to explain the disadvantages of extensive grazing. Some candidates mentioned that extensive grazing is selective and the pasture diversity suffers, that it is inefficient both in terms of livestock nutrition and pasture stability which can lead to erosion. The animals themselves are

difficult to manage for mating and disease control, they may stray or be stolen, all of which could gain credit. They are not more likely to catch disease than animals in intensive conditions so this was not given credit as it is incorrect.

Question 13

- (a) A full range of answers were seen with a lot scoring most or all of the credit. The most quoted example was the aphid. Many candidates gave detailed accounts of the life cycle including parthenogenesis. Details of damage caused to crops were well explained but the spread of the pest was often ignored.
- (b) Knowledge of cultural pest control was limited to crop rotation in most answers. Other examples that were occasionally seen include early planting, use of clean seed, planting resistant varieties and clearing the soil of old plants and exposing the eggs and larva of the pests.
- (c) Candidates were more inclined to give the disadvantages of chemical control rather than the advantages of cultural control. Less damage to the environment and no chemical residue on crop were the most quoted advantages. A point mentioned by a few candidates is that beneficial organisms, such as pollinating bees, are not harmed. A few candidates gained credit for noting that cultural methods are usually cheaper and the crops can be sold for a premium price.

Question 14

- (a) The definition of weaning was well answered. Full credit was given for mentioning what replaced the milk.
- (b) There were some very good answers to this section scoring all or most of the credit, giving relevant and accurate detail. It should be noted that the penis of bull, sheep and goat does not engorge with blood like a horse but is thrust forward by the sigmoid flexure.
- (c) A lot of answers to this part were superficial, gaining only limited credit, e.g. 'The farmer selects a well-built bull and mates it to a high milk yielding cow to get an improved calf'. The improvement comes when the selection process is continued over generations. Points such as the use of line breeding and cross breeding to establish breed characteristics were rarely seen.

AGRICULTURE

Paper 0600/02

Coursework

This is the first year of the revised syllabus and the Moderators were delighted with the overall standard of coursework produced by candidates across the ability range.

Centres need to take note of the comments in the report below to ensure that future candidates more accurately meet the marking criteria for each skill area. Moderators have this year been very positive with the interpretation by Centres of the marking criteria.

Next year Centres must take care to prepare candidates so that they are more aware of the marking criteria and fully address them. Candidates may be better able to address the marking criteria if given a copy of the marking criteria.

Practical Exercises

Centres appear to have carried out an appropriate range of practical exercises and candidates certainly demonstrated their high standard of performance in carrying out their practical exercises by demonstrating their skills when carrying out their investigations.

It would be expected that candidates would achieve highly in this part of the examination but that not all candidates would for all practical exercises perform at the highest standard. Almost all Centres showed clear evidence of differentiation in their marking of practical exercises and only awarded the highest marks to candidates performing at the highest possible standard of practical agricultural and scientific skill.

Centres are strongly advised to take note of the comments contained in the Moderators report to the Centre where clear explanation of the expectation for the production of evidence required to support these marks is given. As referred to below, candidates should be encouraged to collect evidence as diaries, constructive critical reflection and the use of annotated photographic evidence or video clips.

Such work should not be seen as an extra requirement but as an effective way of enhancing the learning process for the candidates. Careful preparation and learning through practical exercises will provide the candidates with the skills needed to carry out their practical investigation in an effective way.

Most work that was seen was safe. Centres should note that it is the responsibility of the teacher to ensure that the work planned is safe and legally permitted by local legislation. It is recommended that a simple risk assessment be carried out by the teacher for each of the practical tasks and investigations to ensure that the health and safety of the candidates is not put at risk by the planned activities. At best, evidence included such risk assessments.

Examples of tasks used for the practical exercises

Imaginative teachers and candidates found that almost any agricultural task or activity can be used as a basis for the assessment of practical skills through the practical exercises. Such tasks were carried out in almost every agricultural context, from school or college farms, through allotments and backyard chicken keeping to extensive sheep herding or cattle ranching.

It was clear that many candidates had sufficient opportunity to acquire and practice the skills to be assessed before the assessment so that they can confidently show what they can do. Where animals were involved, it was clear that many that candidates had been properly trained in dealing with the animals, both for their own safety and also to ensure the humane treatment of the animals concerned. This assessment was, for these candidates, able to give a positive reward for the skills that have been acquired by the candidates, as many Centres had made sure that their candidates had been properly prepared.

Tasks associated with crop production

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

The following are examples of tasks that proved suitable, but clearly this is not exhaustive.

- digging with a spade or adze to produce a rough tilth
- ploughing with a hand-drawn, animal-drawn or tractor-drawn plough
- preparation of a seed bed using hoes, rakes or mechanical cultivators or tractor-drawn cultivators and harrows
- seed sowing (by hand, drills left open for checking depth and spacings; using a hand or tractor-drawn drill, settings of drill left for checking)
- fertilising (calculation of quantities, placement, top dressing)
- transplanting and shading
- mulching
- weeding by hand, using a hoe or flame gun
- pruning
- crop protection (spraying, pest and disease control)
- harvesting and storage of crops

Tasks associated with livestock / poultry production

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

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

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

Evidence of performance of practical exercises

The practical exercises involved candidates in tasks and activities in which they demonstrated skills which were assessed and will, on some cases, generated sufficient appropriate evidence of the demonstration of the skill for moderation.

Assessment of the practical exercises by the teacher was mainly carried out at the time of the performance of the skill by the candidate, ensuring that these assessments were authentic. Some teachers presented tick-sheets, notes or other teacher-dated records to document the assessment, for later transfer onto the mark sheets. However these tick-sheets and teacher-dated records do not provide evidence of the *candidate's* performance that is suitable for moderation since such evidence should show the *candidate* performing the task or activity.

Appropriate evidence for moderation of the practical exercises took many forms. What was being sought was authentic evidence that shows that the candidate has carried out the various chosen practical tasks or activities. Some Centres had provided such evidence, showing that the candidate has skills in such practical agricultural work, and also when the work was carried out.

The preferred forms of evidence were those those generated by the candidate and those showing the candidate carrying out the work. Some Centres provided these conveniently presented on a usb flash stick, CD or DVD disk. The evidence for the entire sample of candidates for moderation in some cases fitted on a single stick or disk which was acceptable as long as it was very clear which evidence belongs to which candidate, e.g. by putting the evidence for different candidates into different folders, labelled with the candidate number and name. Some Centres provided appropriate evidence on paper, which is permissible, although evidence on a stick or disk is to be preferred.

The best authentic records generated during candidate activities included the date when the practical activity was carried out and encompassed:

- Photographs of the candidate doing the task or activity. The best images clearly showed the individual candidate carrying out the skill being assessed. These images were sometimes presented in a convenient form (e.g. jpeg, gif or bmp) or in a document or presentation with written or audio annotations referring to the skills, by the candidate, as well as their thoughts about their own performance of those skills (critical reflections).
- Short videos of the candidate carrying out the task or activity (at best, not longer than 1 minute per activity). In a few cases candidates added annotations and critical reflections as an audio or written commentary. Titles and editing were rarely seen and are not required.
- Original diaries or notes recording the candidate's carrying out of the tasks and activities. At best these had not been edited or written up neatly. They represented the authentic records kept by the candidate of the skills, and critical reflections, at the time of doing the task or activity.

Practical Investigation.

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

It would be very helpful if Centres would annotate to indicate the type and amount of support given to candidates in forming their hypothesis. The most able candidates collected a range of supportive background information and used this to support the formation of their hypothesis and to support the science that would underpin their investigation.

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

Planning was one of the weakest areas in that planning and forming a hypothesis for many candidates tended to be confused as the same. Where an excellent hypothesis is formulated and practical work, relevant to the hypothesis, is carried out it would be difficult in many cases for the reader to replicate the investigation. The plan should incorporate the necessary steps required to carry out the investigation, the resources required and the time scale of the investigation. Some of the strongest candidates referred to their background research and hypothesis and used this to evolve a suitable plan for carrying out their investigation within the limitations of the Centres resources. It was extremely pleasing to read how

candidates had used the ingenuity of their teachers and families to gain access to livestock or land to carry out their individual practical investigation.

3. The handling of evidence.

The results need to be recorded in clear labelled tables and the data used to produce relevant and appropriate graphs. The most able candidates annotate their graphs and charts to identify anomalies or relevant points of interest e.g. environmental events beyond their control, storms, droughts, wild animals etc.

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

Candidates should be encouraged to do far more than state or describe the results they have obtained. The strongest candidates fully explain the reason for the results and the conclusions they can draw from the results supporting their deductions with the underlying science, and with reference to the initial research which allowed them to affectively formulate their hypothesis. Too many candidates see experimental error or natural events beyond their control as spoiling or limiting their ability to draw conclusions and evaluate appropriately. Candidates should be encouraged to show and explain the importance of events beyond their control, and link these to the conclusions that can be drawn from such events.

5. The ability to recognise limitation of the investigation

This is an area where Moderators found marking to be over generous, usually because candidates made simple comments without an explanation as to why these were limitations and failed to explain how future amendments or alterations could help to overcome the problems encountered.

6. Description of investigation, presentation, layout and originality (candidates own work).

Most Centres marked this section accurately and in general the investigations were well presented across the full ability range of the candidates. Centres should be encouraged to present their work using appropriate sub headings, and making full use of diagrams and charts. Photographs greatly improve the reports making it easier to see and understand the work undertaken and to show the outcomes. Effective annotation of such evidence aids their learning and their ability to draw affective conclusions and explain the limitations of their investigation. A few candidates made basic errors failing to produce a list of contents, page numbers or bibliography.

Summary

Moderators would like to congratulate, teachers, lecturers and most importantly the candidates who have produced coursework of a very high standard and demonstrated an appreciation of the importance of the practical aspects of work carried out by the candidates in agricultural Science. The reports were most interesting and rewarding to read.

It was most evident that across the ability range candidates were motivated and produced valuable coursework helping to prepare them for their future lives.

Centres are strongly advised to read the *Coursework Training Handbook* document for developing the coursework even further.

As suggested above, it would be worthwhile considering recording and entering the candidates' work electronically either on CD or memory stick. This will enable better use of photographic and video evidence, helping to motivate the candidates and saving on the cost of reprographics. Some of the portfolios presented contained some excellent colour photography, but must cost centres a great deal in both reproduction and postage.