

AGRICULTURE

Paper 5038/11

Paper 1

Key Messages

Some multiple choice questions were located within **Section A**; candidates should check carefully that they have responded to all the questions and that their responses are recorded in the expected style and appropriate place.

Section B required longer answers involving extended writing with the choice of two essays from five. Candidates should read the instructions carefully and should not attempt to answer all questions. Candidates need to take note of the mark allocations for each question part and relate their answers to the number of marks available. No credit is awarded for rewriting the question in their responses and this wastes time.

There were also questions which included interpretation and analysis of data. Candidates are advised to show their working in full.

General Comments

Candidates' responses to the questions were generally good.

Practical experience of agriculture was examined in a number of questions. For example, **Question 1(b)** tested knowledge of tree and bush clearance for cultivation, **Question 2** the symptoms and treatment of parasite infection, **Question 4** the management of a garden plot and **Question 9** water supply.

Data analysis was included in some aspects of **Questions 3, 6 and 7**. Data was designed to be unfamiliar and in a variety of formats so that the candidates answered using the given data rather than their own knowledge. The stronger candidates gave better responses to these questions. However, almost all candidates attempted them.

Candidates need to understand that the term 'suggest' means there may be no right or wrong answer; we are looking for sensible suggestions. Many candidates offered good suggestions in **Question 5(c)**. Fewer candidates offered acceptable responses to **Question 8(b)**.

Section B comprised five long answer questions from which candidates had to choose two; candidates should not attempt to answer all the questions. It is important that candidates relate their answers to the number of marks available. In this section there were many excellent accounts which showed a high level of knowledge and a good command of English. Many answers were detailed and well organised and a large number of very high quality responses were seen.

Comments on Specific Questions

Section A

Question 1

- (a) This question was well answered by the majority of candidates.
- (b)(i) This question was well answered by the majority of candidates. Some candidates did not mention burning and few referred to the removal of rocks.
- (ii) This question was well answered by the majority of candidates

- (iii) This question was well answered by stronger candidates.

Question 2

- (a) This question was well answered by the majority of candidates. Some candidates placed letter S inside the stomach on the diagram.
- (b)(i) This question was well answered by the majority of candidates. Some candidates listed external parasites, of which the tick was the most common.
- (ii) This question was well answered by the majority of candidates.
- (iii) This question was well answered by the majority of candidates.

Question 3

This question includes data analysis and tests knowledge of soil characteristics, pH and understanding of the impact of the application of lime and manure on soil pH.

- (a) This question was well answered by the strongest candidates.
- (b) This question was well answered by the majority of candidates.
- (c) Good answers were seen from the strongest candidates who correctly related pH to acidity and alkalinity and the impact of lime addition. A common error was to say that the addition of lime reduced pH.
- (d)(i) This question was well answered by the majority of candidates.
- (ii) This question was well answered by the majority of candidates.
- (iii) This question was well answered by the majority of candidates.
- (iv) This question was well answered by the strongest candidates. Many candidates provided general answers and did not link the lime requirements of crops and grass.
- (e) This question was well answered by the strongest candidates. Some candidates did not link acidity to the presence of animal dung.

Question 4

This question includes data analysis and explores practical knowledge of the management of a garden plot, including thinning, pest and weed control.

- (a) This question was well answered by the majority of candidates.
- (b) This question was well answered by the majority of candidates.
- (c) This question was well answered by the majority of candidates.

Question 5

- (a) This question was well answered by the majority of candidates.
- (b)(i) This question was well answered by the majority of candidates.
- (ii) This question was well answered by the majority of candidates.
- (iii) This question was well answered by stronger candidates. A common misconception was Y.
- (c)(i) This question was well answered by the majority of candidates.

- (ii) This question was well answered overall by stronger candidates. Most candidates presented well explained answers based upon reduced photosynthesis. Fewer described water loss or disease entry as effectively.

Question 6

This question includes data analysis, tested knowledge of food groups and their uses, fibre digestion in non-ruminant animals and explored understanding of animal stocking density and its impact.

- (a) (i) This question was well answered by the majority of candidates.
- (ii) This question was well answered by the majority of candidates.
- (b) (i) This question was well answered by stronger candidates. Some candidates provided answers which were not precise enough in terms of the actual function of dietary fibre.
- (ii) This question was well answered by the strongest candidates. Some candidates discussed the caecum.
- (c) (i) This question was well answered by stronger candidates.
- (ii) This question was well answered by the strongest candidates. A common incorrect answer was to give the mass after 82 days, rather than at the start.
- (iii) This question was well answered in part by the majority of candidates, who correctly linked stocking density and growth rate/body mass. The strongest candidates went on to correctly link this to food intake.
- (iv) The most common misconception was to assume that mortality increases with stocking density rather than to refer to the data given in the question.

Question 7

This question includes data analysis, focusing on plant breeding, genetic crosses, genetic engineering and its implications.

- (a) This question was well answered by the majority of candidates.
- (b) The strongest candidates answered this question well. Common misconceptions were to repeat the cross shown in the question stem rather than to cross the F_1 and few candidates described selective breeding accurately. Some candidates confused plant breeding and the use of technology in genetic engineering. The concepts of dominance and homozygosity were not correctly described by the majority of candidates.
- (c) (i) This question was well answered by stronger candidates.
- (ii) This suggest question was well answered by the majority of candidates.

Question 8

This question focuses on the practical implications of livestock grazing and pasture drainage, seeking some open-ended responses.

- (a) (i) This question was well answered by stronger candidates. Some candidates showed confusion over the term browsing.
- (ii) This question was well answered by the majority of candidates.
- (iii) This question was well answered by the majority of candidates.
- (b) (i) This question was well answered by stronger candidates, many of whom identified the risks to animals caused by open ditches. Common misconceptions were that the ditches themselves

caused erosion rather than flowing water and that ditches required more skill than underground piping.

- (ii) This question was well answered by the strongest candidates. Candidates must read and consider the question carefully; some applied incorrect drainage characteristics to heavy loam and light sandy soils.

Question 9

This is a question about the provision and improvement of water supply to a farmstead, incorporating source analysis and seeking open-ended responses.

- (a) (i) This question was well answered by stronger candidates. A common misconception was that pipes can simply be cut and joined; stronger candidates gained additional credit by describing how the insert was secured in the pipe to avoid leakage.
 - (ii) This question was well answered by the majority of candidates. Many good answers described constant supply, higher pressure and purified supply.
- (b) This question was well answered by the majority of candidates.

Section B

Question 10

- (a) The concept of translocation was well understood, described and explained overall. Some candidates confused the role of the phloem with that of the xylem and discussed nutrient uptake. There were few regular misconceptions but some candidates referred to the transport of starch.
- (b) The majority of candidates identified a pest and correctly described the mode of action of a systemic pesticide and its impact. Many excellent answers were seen.
- (c) Many excellent answers were seen. This question was very well answered overall and the only common misconception was the direct effect of pest control chemicals on soil fertility.

Question 11

- (a) Many excellent, labelled diagrams clearly outlined the female reproductive system but some responses included incorrect identification of system parts, scaling and location. A small number of candidates confused the reproductive and digestive systems.
- (b) This question was well answered by the majority of candidates, who demonstrated particularly good understanding of the advantages of artificial insemination.

Question 12

- (a) Most candidates correctly explained what is meant by the term pollination.
- (b) This question was well answered by almost all candidates, many of whom were awarded full credit.
- (c) This question was very well answered by the majority of candidates. The concept of asexual reproduction was well understood and described. For candidates to gain maximum credit responses needed to include more detail after planting, e.g. ridging, watering and fertiliser application.

Question 13

- (a) This question was well answered by the majority of candidates, many of whom achieved maximum credit.

- (b) This question was well answered by the majority of candidates who offered precise and detailed answers. Some errors were seen concerning the description of the role of bacteria in legume root nodules.
- (c) This question was well answered by the majority of candidates. Candidates were clear regarding the impact of excessive water and gave many good descriptions of how to reduce this. A few candidates outlined the importance of the solubility of nitrates in this process.

Question 14

- (a) This question was well answered by the majority of candidates, who demonstrated good awareness of practical agriculture and were able to transfer ideas from other syllabus areas into their answers.
- (b) This question was well answered by the majority of candidates, who clearly justified their choices.

AGRICULTURE

Paper 5038/12

Paper 1

Key Messages

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There were also questions which included interpretation and analysis of data. Candidates are advised to show their working in full.

General Comments

Candidates' responses to the questions were generally good.

Practical experience of agriculture was examined in a number of questions. For example, **Question 1** tested the use of farm tools and implements, **Question 3** the process of seed sowing and **Question 9** livestock building construction.

Candidate data response skills are also tested and the examination tested data response, for example aspects of **Questions 2, 5, 6 and 9**. The data is designed to be unfamiliar and in a variety of formats so that the candidates answer from the given data rather than their own knowledge. The stronger candidates gave better responses to these questions. However, almost all candidates attempted them.

Section B comprised five long answer questions from which candidates had to choose two; candidates should not attempt to answer all the questions. It is important that candidates relate their answers to the number of marks available. In this section there were many excellent accounts which showed a high level of knowledge and a good command of English. Many answers were detailed and well organised and a large number of very high quality responses were seen.

Comments on Specific Questions

Section A

Question 1

- (a) This question was well answered by almost all candidates.
- (b)(i) This question was well answered by the majority of candidates.
- (ii) This question was well answered by the majority of candidates.
- (iii) This question was well answered by almost all candidates.

Question 2

This question incorporates data analysis.

- (a) The strongest candidates correctly described how the land could be reclaimed for productive agricultural use. Few candidates suggested drainage.
- (b)(i) This question was well answered by stronger candidates.
- (ii) Most candidates gave answers which earned some credit demonstrating their ability to connect information from different syllabus areas. Common weaknesses were absolute statements such as 'trees cannot grow in water' and 'animals cannot graze in water', which lacked the necessary precision to be awarded credit.

Question 3

- (a)(i) The strongest candidates answered this question well.
- (ii) The strongest candidates answered this question well.
- (b) This question was well answered by stronger candidates. Very few candidates earned full credit and responses describing time of planting and accurate seed depth or spacing were rare.
- (c)(i) Only the strongest candidates answered this question well.
- (ii) This question was well answered by stronger candidates.

Question 4

- (a) This question was well answered by the majority of candidates.
- (b)(i) This question was well answered by the majority of candidates.
- (ii) This question was well answered by stronger candidates. The most common misconception was to refer to chemical weathering.
- (c)(i) The strongest candidates correctly identified root nodules.
- (ii) The strongest candidates correctly explained nitrogen fixation. Very few candidates accurately described decay releasing nitrogen compounds into the soil.
- (d) This question was well answered by the majority of candidates.

Question 5

This question incorporates data.

- (a) The strongest candidates offered a correct answer. Many candidates provided no answer and others underlined multiple statements. Candidates must follow question guidance carefully.
- (b)(i) This question was well answered by the majority of candidates.
- (ii) This question was well answered by stronger candidates. The most common incorrect answer was to give the value for phosphorus.
- (iii) This question was well answered by stronger candidates. Some candidates gave general answers which lacked the precision necessary to earn credit. A common error was to present N, P and K in the wrong order.
- (c) This question was well answered by stronger candidates. Some candidates gave general answers such as 'kill the plant', which lacked the precision necessary to earn credit.

Question 6

This question incorporates data analysis.

- (a) (i) This question was well answered by the majority of candidates.
- (ii) This question was well answered by the majority of candidates.
- (iii) This question was well answered by the majority of candidates.
- (b) This question was well answered by the majority of candidates.
- (c) (i) The strongest candidates identified carbohydrate and /or bulk.
- (ii) The strongest candidates identified protein and /or nutrients for growth.
- (d) Stronger candidates correctly described the role of fibre in preventing constipation and increasing bowel movement in non-ruminants. Fewer candidates correctly described how ruminants use fibre in their diet.

Question 7

- (a) The strongest candidates offered a correct answer. Some candidates provided additional modes of infection in places where disease names were required.
- (b) This question was well answered by stronger candidates.
- (c) (i) This question was well answered by the majority of candidates.
- (ii) This question was well answered by the majority of candidates.
- (d) This question was well answered by stronger candidates. The most common misconception was to confuse cultural control with biological and /or chemical control.

Question 8

- (a) This question was well answered by the majority of candidates.
- (b) This question was well answered by the majority of candidates.
- (c) (i) The strongest candidates offered a correct answer.
- (ii) This question was well answered by stronger candidates. The most common error was to use heterozygous parents.
- (d) (i) The strongest candidates offered a correct answer.
- (ii) The strongest candidates offered a correct explanation. A common misconception was to identify prick ear as dominant.

Question 9

This question incorporates data analysis and tests ideas about farm enterprise success, poultry feeding and health and livestock building construction.

- (a) Few candidates suggested construction materials and fewer still explained how these could impact upon the building environment.
- (b) (i) This question was well answered by the majority of candidates.
- (ii) This question was well answered by the majority of candidates.
- (c) (i) This question was well answered by the majority of candidates.

- (ii) This question was well answered by stronger candidates, many of whom correctly identified the link between lower costs and lower food intake. Fewer candidates correctly linked this to higher egg production and/or egg mass.
- (iii) This question was well answered by stronger candidates. A common problem was to assume a more negative business impact from the figures provided than shown.

Section B

Question 10

- (a) Many candidates described basic fencing features and accurately listed the necessary components. Stronger candidates linked this information in a coherent way to describe how an effective fence could be constructed. The strongest candidates identified how their suggestions were suited to enclosing large animals.
- (b) Some very good answers were seen from the strongest candidates, clearly justifying why the materials were selected. These answers were rare. Many candidates demonstrated a lack of clarity as to the key reasons for the material choices made.

Question 11

- (a) This question was well answered by the majority of candidates, who were able to provide detail of competition for water, space, light and nutrients in addition to the increased risk of pest and disease infection. It was evident where candidates had experienced this situation through a practical activity.
- (b) Many candidates gave detailed and creditworthy answers gaining close to or full credit.
- (c) The strongest candidates identified key features of different types of weed control and linked these through a cost-effectiveness comparison.

Question 12

- (a) Many candidates gave excellent answers, with clear, well organised diagrams. The most common misconception was to confuse the two intestines.
- (b) The strongest candidates gave detailed descriptions of the role of microorganisms in ruminant digestion, giving specific microbe examples and the products of digestion.

Question 13

- (a) (i) Most candidates were able to describe one or more functions of water in a plant and many gained full credit.
- (ii) This question was well answered by many candidates. The impact of changes in temperature on the rates of diffusion and evaporation were particularly well explained. Some candidates incorrectly described the role and operation of stomata and the strongest candidates gave clear and accurate explanations of both concentration gradient and vapour movement.
- (b) This question was well answered in part by many candidates, who accurately described the cooling effect of water and its role in photosynthesis. Stronger candidates also described the role of water in the transport of minerals and/or nutrients and the prevention of wilting.

Question 14

- (a) Many candidates offered excellent descriptions of soil testing. Fewer candidates described in detail how samples should actually be taken. Most candidates clearly described the addition of water, mixing and the use of an indicator or pH meter to find soil pH and many answers earned high credit. Few candidates described how contaminants could be removed. A common misconception was the incorrect suggestion of red or blue litmus to find pH value.

- (b) The impact of lime on soil pH and its alkalinity were particularly well explained by the majority of candidates.

AGRICULTURE

Paper 5038/02

Coursework

The best Centres produced work accurately marked and annotated by the teacher. Candidates addressed the marking criteria in interesting ways and discussed the outcomes of their investigations in detail.

Many Centres submitted videos, some of a highly professional standard. The enthusiasm of candidates and their hard work was very evident. Most candidates demonstrated great skill. The hard work of teachers was also most evident when candidates were shown working in the field.

The best Centres submitted substantial and well-presented portfolios of evidence for the Practical Exercises and Practical Investigation.

Candidates were able to demonstrate to Moderators their knowledge and understanding of key practical skills used in the production of the portfolios. Many Centres applied the marking criteria accurately. Teachers and candidates should be congratulated for their hard work. It was pleasing that, in some cases, Moderators were able to raise the marks for some Centres who submitted exceptional high quality coursework portfolios.

Some Centres did not adhere to the marking criteria for coursework and did not submit adequate evidence for the practical exercises. Some of this evidence was superficial and they did not provide sufficient information to support the marks awarded. Some investigations were very rushed and the demand of work was low. These Centres have generally had their marks moderated downwards. Centres must devote sufficient time to the practical part of the syllabus to ensure practical and investigative skills have been taught and developed before embarking on producing the coursework. Where this is done it is most evident when moderating the investigations.

Teachers should take note of the comments in this report and in their Centre report. The reports are written with one objective of offering teachers clear guidance on how to improve. This usually identifies one or two key areas.

Centres must take care to prepare candidates so they are aware of the importance of the marking criteria and fully explain and address it. Candidates should be given a copy of the marking criteria. The criteria needs to be discussed in context of the standard of work expected.

Practical Exercises

Most Centres appear to have carried out an appropriate range of practical exercises. The best of these show the high standard of practical skills within the investigations. Other candidates produced detailed diaries recorded throughout the course and supported these with critical reflections and/or annotated photographs. Many Centres are now producing fascinating and informative short video clips and annotated commentary or additional word documents in support of the video clips and presentations.

Centres who offer four simple skills need to be aware that practical exercises need to have more demand. Tasks like clearing ground or digging a plot are not suitable. They should be made more demanding. e.g. clear and cultivate a plot of ground and carry out the cultivation necessary. The follow on exercise could be preparing a plot to sow a crop of beans or similar.

Scientific exercises should be used, e.g. a check of the pH of the plot and action needed to amend the pH for a specific crop or if no action is required candidates should give a reason as to why. Alternatively, to carry out arrange of soil tests to identify the type of soil, humus content and moisture content. This approach will make more use of different skills and greatly enhance the quality of syllabus coverage.

Most Centres give some evidence of differentiation in their marking of practical exercises but some still award high marks with little or no evidence to support or justify such excellence. The awarding of the highest

marks should be for candidates of exceptional skill and ability, producing practical outcomes which fully meet all the marking criteria and perform the related practical scientific skills with high levels of competence, not simply carrying them out in a satisfactory way.

Candidates should be encouraged to collect evidence in the form of constructive critical reflection and the use of annotated photographic evidence or video clips. Diaries may be used but are best with some additional information. This 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 candidates with the skills needed to carry out their practical investigation in an effective way. Work needs to be annotated to help inform the reader, this simple process will greatly enhance learning and understanding.

Practical Investigation

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

Most candidates produced a hypothesis but few really developed or explained their hypothesis or related it to their research, which sometimes took the form of information which was not used to support the hypothesis. Only fully-independent selection and the formation of a challenging hypothesis should be awarded full marks.

The most able candidates collected a good 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. Candidates need to fully discuss the research and reasons for arriving at their chosen hypothesis.

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

Planning was often the weakest area. Candidates need to clearly link the plan to the hypothesis.

The plan needs to be clear and allow a reader to replicate the investigation in a scientific way. It should incorporate the necessary steps required to carry out the investigation and the resources required, including the time scale of the investigation.

Few candidates used the background research to support their plan or related it back to the hypothesis. 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 resources available.

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

3. The handling of evidence.

Some data collected was quite simple and only just sufficient to produce an appropriate analysis. If candidates are to produce meaningful data a minimum of five results taken throughout the process is a good guide. Simply producing a bar chart of final crop yield is not sufficient for the higher marks.

The results need to be recorded in detail and candidates need to indicate any specific procedures which were used to make the collection of data accurate and reliable. Any problems encountered should be indicated and discussed in the conclusion.

Presentation of the data was often simplistic and candidates scoring the higher marks need to incorporate more than one method of expressing the outcome of their investigation. Tables and charts need to be clearly labelled using appropriate units. Graphs need to be fully labelled and annotated to ensure the reader can understand what is being shown.

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. This approach should be encouraged as investigative agriculture often presents variables beyond candidates' control but these need to be considered when presenting and interpreting data.

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

Candidates must be encouraged to do more than simply state or describe the results they have obtained. The strongest candidates fully explain the reason for the results and the conclusions related to the data and outcomes of the investigation. Candidates need to draw conclusions and explain and fully discuss what their results and data shows and how this relates to their hypothesis, supporting their deductions with relevant underlying science. These should be related to their initial research which allowed them to formulate the original hypothesis.

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. It is important that candidates identify and explain how an error may have occurred and impacted on their ability to draw a firm conclusion.

A more discursive approach would help ensure candidates access the highest marks.

5. The ability to recognise limitation of the investigation.

This is an area where Moderators found marking by some Centres to be generous, usually because candidates made simplistic comments without an explanation as to why these were limitations which might have affected their work. Most failed to explain how future amendments or alterations could help to overcome the problems encountered, but made general statements, which were not explained or developed to sufficiently address the marking criteria.

Much more detail and clear explanation is needed to ensure the reader of the report can fully understand why these were limitations and how amendments would improve the outcome. In some ways this is a key aspect of agriculture and anyone entering agricultural industry needs to be able to understand how and why some amendment may be needed or that an event was just an unusual happening.

6. Description of practical, presentation, layout and originality (candidate's 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 which need to be fully explained and annotated. These should also be referenced and link to the discussion in producing conclusions.

Photographs greatly improve the reports making it easier to see and understand the work undertaken and to show the outcomes candidates achieved. Effective annotation of such evidence is essential and aids candidates' learning and their ability to draw effective realistic and scientific conclusions.

Many candidates made basic errors e.g. not producing a list of contents, missing out page numbers or a bibliography and few linked the references within their text.

Where some of the evidence for practical exercise skill tasks is taken from the investigation candidates need to clearly identify this in the investigation.

When choosing practical exercises or topics for investigation it is important to identify the level of demand presented by the topic. Candidates with the potential for top marks need to be advised to devise investigations which allow them to produce work which will access the statements for a grade A. The statements help ensure that teachers marking work are aware of the grade characteristics. Candidates need also to be made fully aware of the descriptors prior to starting the coursework.

Some of the best work demonstrated an appreciation of the importance of the practical aspects of work carried out by the candidates in Agricultural Science, such reports were most interesting and rewarding to read.

It would be worth Centres considering recording and entering their candidates work electronically. Scanned work is quite acceptable and enables candidates to submit a mix of hand-written work and

electronic work and photographs (please ensure scanned work is presented in the correct orientation).

Some Centres produced some fascinating video information and are advised to develop this further with annotation or by adding speech. Moderators are aware of the limitations of cameras and Centre software and are not expecting specific styles, simply effective and easy to view work.