

AGRICULTURE

Paper 0600/11 Theory

Key messages

- Candidates should be reminded to check carefully that they have given an answer for all **Section A** questions.
- Candidates should take note of the mark allocation for each question and plan their answers accordingly.

General comments

There were many good responses to the questions and candidates demonstrated that they had sufficient time to complete the question paper. Candidates showed their practical experience of agriculture in many cases. The examination also tested data response. Almost all candidates attempted these questions.

In many cases, there were answers which were detailed and well organised in **Section B**.

Comments on specific questions

Section A

Question 1

- (a) (i) This question was answered well by many candidates who included a range of features of organic production.
- (ii) This question was answered well by stronger candidates. These candidates correctly identified benefits and potential problems of organic production. Weaker candidates tended not to be able to express potential problems as clearly.
- (b) Many candidates effectively explained ways to increase levels of organic production.

Question 2

- (a) (i) This question was answered well by almost all candidates who applied their knowledge well.
- (ii) Most candidates answered this question well.
- (b) (i) This question was answered well by almost all candidates who applied knowledge of water cycle terms to the question.
- (ii) This question was answered well by many candidates.
- (iii) Stronger candidates correctly identified factors that increase the rate of the process. Some weaker answers lacked sufficient detail.
- (c) The strongest candidates suggested reasons for a later growing season using the diagram well. Some candidates incorrectly suggested that there would be a lack of water available.

Question 3

- (a) (i) This question was answered well by almost all candidates who interpreted the equation question well.
- (ii) This question was usually answered well.
- (b) Many candidates correctly described the relevant storage, translocation or use of sugar in respiration and usually stated that oxygen is released into the atmosphere or also used in respiration.
- (c) (i) Most candidates correctly identified that increasing carbon dioxide concentration increases the rate of photosynthesis from the diagram. Only the stronger candidates described how this increase levels off or another factor becoming limiting.
- (ii) Most candidates correctly identified that increasing light intensity increases the rate of photosynthesis from the diagram.

Question 4

- (a) (i) This question was answered well by almost all candidates.
- (ii) This question was generally answered well by most candidates.
- (b) This question was answered well by stronger candidates who typically described the movement of mineral salts through the xylem and then went on to effectively explain this movement.
- (c) Most candidates answered this well and correctly identified a feature such as surface area, a thin wall or an elongated shape. Some stronger candidates then explained why this helped the root hair cell to take in water.

Question 5

- (a) This question was answered well by almost all candidates with succinct and clear answers.
- (b) (i) This question was answered well by many candidates. The most common issue was to confuse anther and stigma. Some very weak candidates did not draw label lines with sufficient precision.
- (ii) Most candidates correctly described two features which increase the chances of pollination with sufficient depth for credit.
- (iii) Most candidates correctly described how two features of the flower of an insect-pollinated plant may differ.

Question 6

- (a) Most candidates correctly calculated the mass of potassium in the bag of compound fertiliser and stated the correct unit. Some very weak candidates did not attempt the calculation.
- (b) Many candidates correctly described how a compound fertiliser could affect soil pH, often in terms of increasing soil acidity. Stronger candidates could explain this.
- (c) Most candidates correctly described how the addition of lime reduces soil acidity and increases soil pH.
- (d) This question was very well answered by most candidates.

Question 7

- (a) Most candidates identified the small intestine and stomach on the diagram of the non-ruminant digestive system. Some weaker candidates did not identify the stomach and only the strongest candidates correctly identified the location of the caecum.

- (b) This question was very well answered by most candidates. Weaker candidates tended not to describe the function of the liver.

Question 8

- (a) Stronger candidates correctly gave the meaning of the terms lactation and weaning. A small number of weak candidates confused these with other syllabus terms.
- (b) (i) Most candidates described the changes in feed requirements well and applied their knowledge in this question to obtain at least partial credit.
- (ii) Stronger candidates identified the increased energy requirement of the female mammalian farm animal and explained this in terms of milk production, body recovery or to prepare for mating.

Question 9

- (a) This question was correctly answered by many candidates. A small number of weak candidates confused these with other genetics terms.
- (b) (i) Many candidates answered this question well. Stronger candidates correctly and clearly identified the expected ratio of offspring with drought resistance to offspring without drought resistance. Some weaker candidates did not demonstrate an understanding of ratios.
- (ii) This question was correctly answered by most candidates who applied their knowledge well.
- (c) Many candidates made appropriate suggestions for a characteristic that could be bred into a crop. Stronger candidates effectively explained how this could benefit a farmer and their farming business.

Section B

Question 10

- (a) Many candidates accurately described how soil could be improved. One issue was to describe clearance of the area, which was stated as already being used for crop production.
- (b) This question was answered well by some candidates. Many correctly described the timing, method and features of planting and effectively related this to their chosen crop. Stronger candidates extended this to explain how the crop should be cared for in order to maximise yield.
- (c) Many candidates gave detailed answers describing how irrigation and windbreaks can reduce the effects of dry and windy conditions respectively. Stronger candidates also explained the effect of techniques such as mulching, cover cropping and shading.

Question 11

- (a) Most candidates answered this question very well. Many candidates accurately described a piercing and sucking crop pest and its effects on a crop. Some weaker candidates incorrectly named a different type of pest.
- (b) This question was answered well by most candidates. Technical terms were used well by many candidates in well-constructed answers.
- (c) Stronger candidates answered this question very well. There were many detailed answers effectively explaining how growing genetically modified crops could increase farm profits. The strongest candidates also described how farm profits could be reduced. Weaker candidates often stated some possible effects but did not often explain these effectively.

Question 12

- (a) Most candidates were able to correctly describe that a notifiable disease should be reported to relevant authorities immediately.
- (b) This question was answered very well by many candidates. Some candidates clearly linked this question to practical experience of agriculture.
- (c) The strongest candidates gave a range of answers explaining how the spread of infectious diseases between farm animals can be reduced by good stockmanship, including explanations of these. Weaker candidates often described techniques but did not often explain these effectively.

Question 13

- (a) Stronger candidates answered this question well. Weaker candidates often described a different syllabus term.
- (b) Many candidates correctly described at least some features of livestock housing suitable for large livestock. Weaker candidates tended not to apply the context of the question fully and so gave some limited responses.
- (c) Generally, this question was answered well. Stronger candidates included good explanations of the implications of poorly designed livestock housing for animal ill-health. Weaker candidates did not explain these implications effectively.

Question 14

- (a) Many candidates clearly described how a supply of water could be obtained and stored. Weaker candidates often described storage less effectively.
- (b) Many candidates gave clear answers accurately describing the process of distribution of water supplied to a farm to animals, demonstrating knowledge and, it seemed, their practical experience. Weaker answers often lacked detail.
- (c) Stronger candidates correctly identified that water could contain pathogens, be smelly and unpalatable or contain dangerous solids. The strongest candidates went on to describe how water could be treated to address these issues in various ways.

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Paper 0600/12 Theory

Key messages

- Candidates should be reminded to check carefully that they have given an answer for all **Section A** questions.
- Candidates should take note of the mark allocation for each question and plan their answers accordingly.

General comments

There were some very good responses to the questions and candidates demonstrated that they had sufficient time to complete the paper. Some candidates showed aspects of their practical experience in their answers. The examination also tested data response. Almost all candidates attempted these questions and stronger candidates tended to deal with these effectively.

In many cases, there were answers in **Section B** which were detailed and well organised demonstrating good levels of theoretical knowledge and application.

Comments on specific questions

Section A

Question 1

- (a) (i) This question was answered well with candidates generally correctly applying skills to the diagram.
- (ii) Stronger candidates answered this question well, describing a wide range of benefits and potential problems linked to town growth. Weaker candidates typically described benefits for the town, rather than for the Two-rivers Farm.
- (b) This question was answered well by most candidates with a wide variety of responses seen offering suggestions as to how to diversify the farming business.

Question 2

- (a) (i) This question was answered well by stronger candidates. Weaker candidates showed confusion over this syllabus term.
- (ii) This question was answered well by stronger candidates who showed a range of reasonable responses.
- (b) Many candidates correctly described a negative impact of poor drainage on plant growth. Stronger candidates then explained this effectively.
- (c) (i) This question was answered well by some candidates. Weaker answers tended to lack detail.
- (ii) Stronger candidates answered this question well, often comparing features of sandy and clay soil, linking this to drainage rate and water-holding capacity and the need for irrigation. Some weaker candidates stated incorrect features of these soils.

Question 3

- (a) This question was usually answered well. Most candidates described transpiration effectively. There was some confusion with photosynthesis by weaker candidates.
- (b) This question was answered well by many candidates. The most common issue for weaker candidates concerned understanding humidity.

Question 4

- (a) This question was answered well by stronger candidates who showed good knowledge of grazing systems. Weaker candidates sometimes described intensive grazing systems instead.
- (b) Stronger candidates answered well identifying many pasture improvements and grazing adjustments. Weaker candidates tended not to be able to apply their knowledge.
- (c) Many candidates described potential problems which could arise from intensive grazing systems. Stronger candidates were able to provide linked explanations for these problems.

Question 5

- (a) (i) This question was answered well with many candidates correctly reading from the graph. Some weaker candidates did not give an appropriate unit.
- (ii) This question was answered well with many candidates able to apply skills to this graph. Some weaker candidates did not give appropriate units.
- (iii) This question was answered well with many candidates also showing their working.
- (b) This question was answered well by the stronger candidates who correctly applied the graph and explained how further application of nitrogen fertiliser would result in increased yield for only one variety.
- (c) This question was answered well by most candidates who suggested a wide range of possible disadvantages of a high application of nitrogen fertiliser.

Question 6

- (a) (i) This question was answered well by stronger candidates. Practical experience seemed to be used well to describe signs of possible ill-health in livestock in many responses.
- (ii) This question was answered well by the majority of candidates. Many candidates correctly identified a way in which disease can spread between livestock and stronger candidates successfully described appropriate methods to reduce this.
- (b) Many candidates correctly described problems that could be caused by livestock parasites. Some candidates provided effective explanations for these problems often linked to negative impacts on production.

Question 7

- (a) Many candidates answered this question well and showed good application of knowledge. The most common error was to confuse the testicle with other parts.
- (b) Many candidates correctly suggested qualities farmers would look for when choosing animals for selective breeding.
- (c) Stronger candidates identified that artificial insemination can reduce sexual transmission of infection, the risk of injury and animal stress levels. Some weaker candidates referred instead to animal feeding routines.

Question 8

- (a) Most candidates identified the correct letter in all parts of this question, demonstrating good knowledge of the digestive system of farm animals.
- (b) Many candidates clearly described the role of the small intestine. Some candidates demonstrated an understanding of the role of the large intestine. Some weaker candidates tended to confuse the roles.
- (c) The strongest candidates answered this question well. Some explanations used appropriately detailed terms well, especially when describing animals chewing the cud and digesting cellulose.

Question 9

- (a) This question was correctly answered by only the strongest candidates. A small number of candidates could correctly describe an allele and this was often confused with other genetic terms by weaker candidates.
- (b)(i) This question was answered very well by most candidates who correctly identified gametes and offspring genotypes.
- (ii) The strongest candidates answered this question well, explaining the presence of the dominant allele in all offspring and the result of this dominance in terms of drought resistance. Weaker candidates could not explain clearly and typically offered confused responses.
- (c) Stronger candidates typically suggested a range of reasonable responses to this question.

Section B

Question 10

- (a) Stronger candidates effectively stated that a compound fertiliser provides more than one major nutrient. Some candidates were able to suggest one correct example. Weaker candidates demonstrated little awareness or understanding of the term.
- (b) This question was answered well by many candidates, who demonstrated a clear understanding of how the nitrogen cycle works. Stronger responses identified and linked specific processes of the nitrogen cycle and then related this to its impact on soil fertility by providing readily available nitrogen to plants.
- (c) Some candidates answered this question well, using detailed answers to effectively explain how organic fertilisers improve soils. Some weaker candidates demonstrated a lack of understanding of the term organic fertiliser.

Question 11

- (a) Most candidates answered this question well and demonstrated a clear understanding of how biological pest control works. Stronger candidates often provided correct examples. Some weaker candidates referred to the use of chemical pesticides instead.
- (b) This question was often answered very well. Many candidates correctly identified a range of cultural pest control methods demonstrating detailed knowledge and, it seemed, the application of practical experience.
- (c) Stronger candidates correctly described ways in which to store and use farm chemicals safely and then clearly explained how each enhanced safety. However, weaker candidates provided only descriptions of the safety aspects of key tasks and did not explain these effectively.

Question 12

- (a) Many candidates gave detailed descriptions of how weeds spread within crops and tended to gain full credit.
- (b) Most candidates described a range of non-chemical ways in which weeds can be controlled in crops, often developing answers effectively to describe the importance of removing all weed roots and rhizomes.
- (c) Stronger candidates effectively described the problems caused by weeds in crops including competition of weeds for various factors and often explained the negative effects on the crop itself. Weaker candidates did not explain these problems effectively.

Question 13

- (a) Stronger candidates answered this question well and described loam soil in detail. Some candidates described loam soil incorrectly and confused it with other soils.
- (b) Generally, this question was very well answered. Many candidates correctly identified many steps in testing the soil pH of a field, including sampling, mixing and testing detail.
- (c) Stronger candidates correctly explained the dangers of excessive heat to some crops. Weaker candidates did not explain these impacts effectively. Only the strongest candidates were able to correctly explain some dangers of frost.

Question 14

- (a) (i) Stronger candidates clearly described the roles of the mouldboard plough, cultivator and harrow. Weaker candidates appeared unfamiliar with the use of these.
- (a) (ii) Many candidates correctly named two other tools used for cultivation and some correctly described a range of ways in which these tools should be maintained. This question was often answered well.
- (b) Stronger candidates correctly explained both advantages and disadvantages of farm mechanisation. Weaker candidates often did not explain these effectively.

AGRICULTURE

Paper 0600/02 Coursework

Key message

- The coursework should be incorporated into the teaching scheme of work. This approach enables the practical work to enhance the understanding of agriculture in practice and incorporates the related science and economic awareness.
- Photographic evidence is invaluable in supporting practical exercises and in the production of the candidates' investigations. Photographs and any other visual material should be annotated to explain the task being demonstrated and could include comments which identify the problems encountered, followed by another photograph showing how any problem was solved or managed.

General comments

Coursework was submitted from diverse countries with a wide range of practical agriculture tasks and skills being practised. There were some submissions of a high standard.

This year more centres made use of short video clips and these were often valuable when they included a simple commentary on the task being performed. Candidates' videos or extensive photograph evidence often demonstrated their skill and pride in the tasks they were performing. The use of annotated photographs and video clips showed candidates working enthusiastically and developing a comprehensive understanding of agriculture through the practical application of the syllabus.

A few centres awarded 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 statements.

Comments on specific marking criteria

Practical Exercises

Most centres carried out an appropriate range of practical exercises. Evidence of practical skill ability was seen with most work demonstrating high levels of competence. The range of exercises offered in many cases came from relatively easy tasks based around growing crops. Animal-related exercises were clearly limited by some centres' abilities to keep and care for livestock.

Some practical skills were learnt and evidenced within the candidate investigative projects. Up to three practical exercises can be incorporated within an investigation. However, not all investigation topics allow three exercises which can offer a high level of demand to support the strongest candidates.

Centres which offer four simple exercises need to be aware that practical exercises need to have sufficient demand to allow for full marks to be awarded. Simple tasks, like clearing ground or digging a plot, are not suitable for high marks unless linked to candidates identifying problems, finding resolutions for the problems encountered and describing in sufficient detail an explanation of what is shown and reasons for the expected outcome. Tasks need to allow candidates to fully demonstrate their ability and should be made more demanding for stronger candidates. Centres need also to choose exercises which make best use of their local environmental conditions as well as the individual candidate's ability.

There were some good examples of tasks where candidates selected some scientific exercises incorporating laboratory based tests along with cultivation tasks, e.g. to check the pH of the plot and take any action

needed to amend the pH for a specific crop (if no action is required candidates should give a reason as to why not), or to carry out a range of soil tests to identify the type of soil along with its humus and moisture content. This approach allows candidates to demonstrate different skills and greatly enhances the quality of syllabus coverage ensuring it is accessible to a wide range of candidate abilities.

Many candidates produced detailed records of evidence throughout the course and these were supported by constructively critical reflections, a skill task. Some centres require further development in this area and candidates need to submit more than a few photographs without any further guidance notes.

Few candidates used PowerPoint presentations to present their critical task reflections. Where this method is used the candidates often produced very effective evidence allowing them to illustrate and explain each exercise making good use of photograph evidence and making it easy to demonstrate and discuss what was being carried out and how it impacted on the practical exercise.

This year some candidates used tools and equipment such as hoes and spades without full control of the implement being used. Some candidates were seen holding both hands at the top of the handle and so were not able to control the blade of the tool effectively or safely. In some cases these submissions were over marked. Centres should use the marking criteria accurately to differentiate performance.

Some centres need to ensure that practical exercises are realistically marked, demonstrating differentiation of the task and only awarding full marks for excellent work demonstrating a high level of practical skill ability.

Some centres should take note of the guidance given in the coursework handbook. Generally effective annotation was more evident this year.

Practical Investigation

The range and diversity of topics being investigated was good this year and the quality of presentation was often good. Some work was detailed and fully explained. Some candidates incorporated research into their plans and then made full use of the data collected to produce well-reasoned deductions based on the relevant science and agricultural practice.

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

In some cases all candidates from a centre carried out very similar investigations which suggested that centres had led decisions on the practical work. Where it is not clear how the candidate selected and researched and selected the topic the teacher must annotate as required.

Most candidates produced a hypothesis. However, some candidates did not fully develop, justify or explain their findings in the context of their investigation. Candidates need to relate their hypothesis to their own research and evidence it in a way which demonstrates their understanding of the investigation.

Centres should annotate candidates' work to indicate the support given to candidates in developing their hypothesis to demonstrate its originality. Only fully independent selection and the formation of an appropriate challenging hypothesis should be awarded full credit.

The strongest candidates collected a good range of relevant background information and used this to support the formation of their hypothesis and used the underlying agricultural principles which are related to scientific knowledge to lead their investigations. Candidates should fully discuss the research and reasons for arriving at their chosen hypothesis. The criteria are best covered when candidates have been given sufficient time to plan and prepare for their investigation. Too often candidates appeared to have been given a task and they did not show motivation or an awareness of the related background agricultural and scientific content and were unable to demonstrate its use in forming the hypothesis.

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

A plan needs to be clearly explained to enable the reader to replicate the investigation in a scientific way. It should incorporate the necessary steps required to carry out the investigation and identify the resources required including the time scale needed to carry out the investigation. Many candidates had planned well and the strongest candidates clearly linked their plan to their hypothesis and this was supported by detailed evidence which was suitably referenced.

Some of the strongest candidates referred to their background research and their hypothesis and used this to evolve a suitable plan for carrying out their investigation. Where amendments to the plan were required these candidates explained and justified their modifications of the plan.

3. The handling of evidence

The data collected was often quite simple and only just sufficient to produce a simple analysis of the results. If candidates are to produce meaningful data they need to have taken a comprehensive range of results throughout the investigation. Simply producing a bar chart of final crop yield is insufficient to access the higher bands of the mark scheme.

Presentation of the data was also often simplistic. The strongest candidates incorporated more than one method of analysing the outcome of their investigation. These candidates provided tables and charts which were clearly labelled using appropriate units with a clear detailed heading. Graphs were annotated to ensure the reader could understand what was being shown.

Results of investigations need to be recorded in detail and candidates need to indicate any specific procedures which were used to collect accurate data, taking care to use an appropriate and reliable sample size. Problems encountered needed to be identified and discussed in detail in the conclusion, and where possible linked to the related science and agricultural practices being used.

Stronger candidates discussed local modifications to procedures which might be needed to cope with their local environmental situations, such as water shortage or erosion of soil.

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

This is an area which would benefit from more focus and some candidates were unable to produce valid deductions from the evidence. Candidates must be encouraged to do more than simply state or describe the results they have obtained. The strongest candidates fully explained the reason for their results and their conclusions related to the data and outcomes of their investigation. Weaker candidates needed to draw conclusions and explain and discuss their results and outcomes in detail, taking care to use background research and to link this to their own findings.

Many candidates saw experimental error or natural events beyond their control as spoiling or limiting their ability to draw conclusions and evaluate their results appropriately. Candidates need to be encouraged to show and explain the importance of events beyond their control, and to link these to the conclusions that can be drawn from such events when addressing the final outcomes. It is important that candidates identify and explain how error may have occurred and how this might impact on their ability to draw a firm conclusion.

5. The ability to recognise limitations of the investigation

Some candidates addressed this criterion in detail and attempted to demonstrate a clear understanding of this skill by fully explaining the limitations of their investigations. The strongest candidates took great care to fully explain how future amendments or alterations could possibly overcome the problems which they had encountered. However, some candidates made general statements which were not explained sufficiently to meet the marking criteria. More detail and clear explanation was needed to ensure candidates could fully access the available marks. The importance of this skill needs to be explained to candidates before attempting to deliver the coursework. Recognising limitations is a key aspect of agricultural and scientific practice.

This was the most frequently overmarked skill and centres are advised to ensure that this marking criterion is fully addressed and not covered by some simple, unsupported comments.

6. Description of investigation, presentation, layout and originality (candidate's own work)

In the strongest submissions, candidates used appropriate subheadings, and made full use of diagrams and charts. The investigations were fully explained and annotated, referenced and linked to the discussion and outcomes obtained in the production of deductions and conclusions.

Photographs greatly improved many reports making it easier to see and understand the work undertaken and these showed the outcomes candidates achieved. This year most candidates' work was supported with annotated photographs which were clearly identified using headings and were referred to and discussed in detail. Where a group photo is used candidates need to clearly identify themselves and say how the photo is relevant and related to their investigation.

Most centres marked this section accurately and in general the investigations were well presented.