AGRICULTURE

Paper 5038/12
Theory

Key messages

Weaker candidates seemed to find handling data difficult. This is a skill area where practice may help.

Key terms should be used carefully when used within responses and explanations.

Candidates should note the marks available for questions to ensure the depth of their response matches the weighting of the question.

General comments

There were some very good responses to the questions overall and candidates demonstrated that they had sufficient time to complete the paper.

There were some strong ***Section B*** responses. Good responses were often detailed and well organised demonstrating good levels of theoretical knowledge and the application of this.

Generally, when providing a response that requires explanation, weaker candidates need to try to ensure they sufficiently develop their points rather than simply stating.

Comments on specific questions

Section A

Question 1

(a) (i) The question required candidates to identify constituents of a typical soil. Some weaker candidates confused the constituents when looking at the pie chart. Most candidates identified organic matter.

(ii) Many candidates realised the importance of organic matter in soil and included suggestions which showed good knowledge.

(b) (i) Candidates were required to suggest methods to improve drainage. Overall, this was well answered and responses showed good application of knowledge.

(ii) This was not well answered by weaker candidates who often did not explain well or left points underdeveloped.

Question 2

(a) (i) This question required candidates to have an understanding of the nitrogen cycle. Some weaker candidates confused the processes listed. Most candidates correctly identified plant nutrient uptake.

(ii) The question required candidates to consider why farmers did not want nitrates to be converted to nitrogen gas. Stronger candidates understood that plants could not uptake nitrogen as a gas. Weaker candidates could not usually develop their response sufficiently beyond the question wording.

(b) (i) Most candidates were able to calculate the average yield of tomatoes for glasshouse soil.

(ii) Many candidates could give a relevant reason and showed good application of appropriate knowledge.

(iii) The majority of candidates could make one correct suggestion for why hydroponic yields were greater than the other two methods. However, only the stronger candidates were usually able to apply their knowledge fully to obtain further credit.

Question 3

(a) (i) Most candidates recognised the need for washing the inside of a sprayer's tank. However, only stronger candidates considered checking for damaged parts or flushing other parts out as well as the tank.

(ii) Most candidates attempted to describe how pesticides should be stored and many did so well.

(b) (i) Interpretation of the label proved challenging for weaker candidates. Some candidates added up several rates instead.

(ii) Stronger candidates could usually suggest why some weeds required greater herbicide rates.

(c) (i) Some weaker candidates misread the question and described how viruses were transferred by insects. Stronger candidates usually described suitable ways.

(ii) Some weaker responses were limited to repeating the question. The stronger candidates usually linked reduced chlorophyll with reduced photosynthesis and hence less growth.

(d) Stronger candidates could apply their knowledge well and differentiate between these types of pesticide.

Question 4

(a) Some weaker candidates focused on aspects of insect-pollinated plants rather than wind-pollinated plants.

(b) (i) Generally, this question was well answered. Most candidates were able to label a newly germinated bean seedling well.

(ii) Most candidates recognised the usual requirements for germination. Weaker candidates were sometimes too vague, for example by stating temperature only.

(iii) Responses were mixed with regards to how seedlings could be protected from weather conditions. Stronger candidates were perhaps drawing on practical knowledge.

Question 5

(a) (i) Many candidates were able to correctly identify the digestive system of a ruminant.

(ii) Most candidates recognised the function of the oesophagus. Stronger candidates referred to muscle contractions squeezing food through.

(iii) Most candidates recognised the part that was most suited to absorbing nutrients, but fewer could suggest how it was adapted for this function.

(b) This was generally not answered well by weaker candidates. Other candidates correctly outlined relevant aspects.

Question 6

(a) Weaker candidates did not seem to understand the term weaning.

(b) (i) Some weaker candidates were not able to interpret and read the graph to determine the difference in milk production between the two sheep.

(ii) Again, weaker candidates seemed to find it difficult to read the graph.

(iii) Most candidates gained at least some credit here by suggesting why sheep **B** produces more milk than sheep **A**. Stronger candidates showed application of a range of knowledge.

Question 7

(a) While most candidates could identify the ovary. Some weaker candidates were generally not able to identify the cervix, vulva or uterine horn on the diagram of a farm animal.

(b) Most candidates gained at least partial credit here for describing signs that a farm animal was about to give birth. Stronger candidates gave a breadth of relevant responses.

Question 8

(a) (i) Only the stronger candidates were able to state what is meant by an allele and many weaker candidates demonstrated limited knowledge of genetic terminology.

(ii) Candidates demonstrated a mixed understanding of determining the expected ratio and phenotype in a cross between two heterozygous parents. Some candidates did not use the letter d and some used two different letters to show genotype.

(b) Candidates generally demonstrated limited knowledge about how a farmer would be able to breed a disorder out of farm stock. Stronger candidates discussed breeding actions well including selecting normal healthy stock out of a herd and separating stock out that had the observed disorder.

Question 9

(a) This was a well-answered question and most candidates were able to state two sources of water for livestock production. A range of good responses were seen.

(b) (i) Descriptions by weaker candidates generally did not generally provide sufficient detail as to how to join two pipes. Stronger candidates seemed to draw on some practical experience or could at least apply their knowledge well.

(ii) Weaker candidates generally could not apply their knowledge to state the purpose of the compression washer.

(iii) Most candidates were able to provide a reason for joining two pipes.

Section B

Question 10

(a) Many candidates demonstrated a reasonable understanding of farm chemicals. A good application of knowledge was common. Most stronger candidates suggested a broad range of environmental issues surrounding the use of farm chemicals.

(b) Most candidates knew of at least two stages in the life cycle of a biting and chewing pest. Stronger candidates tended to include additional stages.

(c) Candidates usually demonstrated good knowledge of how pests could be controlled organically, citing biological control with examples or various aspects of cultural control. Stronger candidates could usually explain well.

Question 11

(a) Responses were mixed to this question. The stronger candidates were able to suggest the benefits of mixed vegetation in grazing land. However, weaker candidates demonstrated a limited application of knowledge only.

(b) The effects of overstocking were understood by many candidates, and they often cited many relevant issues.

(c) Candidates were required to explain how carrying capacity could be increased. Many provided a range of points. However, in the responses of weaker candidates these tended not to be explanatory.

Question 12

(a) Most candidates demonstrated good understanding of what constituted mixed farming.

(b) The benefits and problems of genetically modified (GM) crops were not clear in some weaker responses, which were confused. Health implications were commonly given for limitations by weaker candidates. Candidates stating cost as a limitation needed to qualify this cost further for credit to be awarded.

(c) Most candidates were able to suggest the benefits of mechanisation. Stronger candidates applied a depth of understanding to a range of relevant areas.

Question 13

(a) The problems caused by parasites to farm livestock were generally well known. Many candidates demonstrated a good understanding of the topic.

(b) The ways farm animals became infected with disease was generally well answered. Responses by stronger candidates usually included a good range of ways, demonstrating secure livestock knowledge.

(c) Many candidates could give at least some relevant points. Some of these were often not further developed or explained by weaker candidates. Qualification and development to explain points was a feature of stronger candidate responses.

Question 14

(a) (i) The majority of candidates knew the key points about soil preparation and were able to provide a named crop. Weaker candidates needed to recognise that the question was specific to soil preparation as some did not focus their response on this aspect.

(ii) Candidates usually showed a good understanding of the methods farmers could adopt to maintain the health and productivity of a crop.

(b) Factors that affected the profitability of a crop after harvest were generally less well understood by weaker candidates. Stronger candidates could apply a broad knowledge base and often made links to economic considerations.

AGRICULTURE

Paper 5038/02
Coursework

Key messages

The coursework should be incorporated into the teaching scheme of work. Centres should consider the local environmental factors and seasons when planning the delivery of the coursework. This approach enables the practical work to enhance the understanding of agriculture in practice and incorporates the related science and economic awareness.

Photographic and video evidence enhances learning and is valuable in supporting the practical exercises and in the production of candidates' investigations. Evidence must be supplied to support marks awarded. Evidence must be unique to individual candidates and should lead to a discussion of how any difficulties or problems were managed or adapted to allow a positive outcome wherever possible. Photographic evidence could be annotated by candidates to explain tasks being demonstrated and should incorporate comments related to factors encountered. Video evidence could include candidate commentaries to evidence knowledge of tasks undertaken.

General comments

The majority of centres submitted candidates work promptly and organised candidates' evidence well. Work was of a good standard and presented in a range of interesting and creative formats. Some centres organise each candidate's work together rather than submitting batches of practical exercises and practical investigations, which aids moderation.

Many centres made full use of photographic and video evidence and incorporated live audio discussion and/or high-quality annotation of photographic evidence of work being performed. The strongest examples included constructive, critical reflections of the tasks being performed. Stronger candidates related their experience to agricultural science. Some centres carried out practical exercises through the investigation focus. This is acceptable for three of the exercises, but the fourth should be from a different area of study. Candidates should be encouraged to take part in many different varieties of practical exercise during the course of study. Few centres offered livestock exercises this year, possibly due to the time and management commitment involved in livestock investigations.

From some centres there was insufficient evidence submission leading to large adjustments. Minor adjustments were made in other cases due to trends at individual centres, the reasons for which are detailed in individual centre reports.

Comments on specific areas

Practical Exercises

Most centres carried out a wide range of practical exercises with many offering a range which was clearly linked to the delivery of the syllabus theory content. When considering practical exercises, it is important for stronger candidates to access an appropriate level of demand and this should be considered in selection. This provides opportunity for these candidates to think critically about the task they are undertaking and suggest improvements to their methods.

It is helpful if centres annotate candidates' work to identify achievement when candidates carry out a task. This could be added to a candidate record card or directly onto candidates' work.

Practical exercise evidence mainly related to crop production involved in individual investigations including plot preparation, planting, weeding, and harvesting. Some centres included skills such as soil testing for pH or soil composition, both of which are key skills supporting theory work and help with many investigation topics, in particular the cultivation-based investigations. Analysis of these supplementary tasks enabled the agricultural science behind any findings to be discussed.

When carrying out a skill/task in a practical exercise, it is important that high marks are only awarded for work where candidates use tools and equipment fully correctly and they demonstrate that they are using an awareness of good health and safety. A few videos and photographs showed multiple candidates using tools and carrying out tasks. When submitting evidence in this format, the materials should be individual, and candidates can annotate their photographs or make commentaries on videos.

Some centres awarded marks very generously. Centres should use the marking criteria carefully and ensure they differentiate performance, only awarding full marks for excellent performances. Effective description, annotation and reflection of exercises was carried out this year by many centres.

Practical Investigation

The range and diversity of topics investigated was generally very good and the quality of presentation often enabled candidates to showcase their creativity. Work of a higher standard was often detailed and fully discussed and explained. Stronger candidates incorporated research into their plans, cross-referencing this with their findings and then made full use of the data collected to produce well-reasoned deductions based on the relevant science and agricultural practice.

The selection of relevant questions (hypothesis) for the investigation

The majority of candidates produced a hypothesis and some also included an alternative hypothesis. Candidates should relate their hypothesis to their own research and evidence it in a way which demonstrates their understanding of the investigation. Where candidates develop the same hypothesis, this should be annotated to show whether it is original or devised as a group, and marks awarded accordingly.

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

The strongest candidates collected a good range of relevant background information and used it when preparing their plans.

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

Methods were generally well researched with a proportion of candidates incorporating a good range of background information. Where candidates accessed additional sources, most of these were included in a bibliography or next to the information.

Equipment and methods stated were usually clear and indicated an understanding of the processes needed to prepare ground for planting and test factors that affect the growth of a crop or animal. The time required to carry out methods was omitted in several cases and this needed to be considered when planning the investigation.

The strongest candidates referred to their background research and their hypothesis and used this to develop a suitable plan for carrying out their investigation. Where amendments to the plan were required, these candidates explained and justified the modifications to the plan in appropriate detail.

The handling of evidence

Many candidates collected a good range of data to support their findings. A good range included measurements of growth of a crop or animal over a period of several weeks. This enables a trend to be seen in data. In some cases, the data collected was quite limited and only just sufficient to produce a basic analysis of 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 higher marks. Stronger candidates investigated different factors on a crop or livestock. These candidates could link their processed data from a number of sources to identify patterns or trends. This included additional data such as volume of water used to water the plants each day/week to consider controlling variables that may affect the validity of their investigations. Acknowledgement of the agricultural science contributing to phenomena was then used in addition to stating basic facts.

Presentation of the data was generally good but many were presented in a simplistic way with little or no explanation. In many cases headings on tables and axis descriptions and units on graphs were not used. Stronger candidates usually incorporated more than one method of analysing their data, showing how it affected the outcome of their investigation. These candidates provided tables and charts which were usually clearly labelled using appropriate units with a clear, sufficiently detailed heading. Graphs were annotated to ensure the reader could understand what was being shown, for example the rate of crop growth and gradient of graph lines. These candidates identified any anomalies clearly and referenced them for further discussion.

Results of investigations need to be recorded in detail and with appropriate precision. Candidates needed to indicate any specific procedures which were used to collect accurate data, taking care to use appropriate and reliable sample sizes.

Stronger candidates discussed local modifications to procedures which might be needed to cope with their local environmental situations, such as water shortages or erosion of soil, and clearly identified the precautions required to ensure results were as accurate as possible.

The ability to make deductions from the evidence or data acquired

In some cases, this was carried out well, focusing on the trends in data acquired and also the scientific reasons for why the trends may have been evident. Stronger candidates also recommended further investigative procedures to check and extend the investigation to ensure repeatability.

Generally, this was an area which would have benefited from more focus as many candidates only focused on the initial trend and were unable to produce valid deductions from their own evidence. Candidates need to be encouraged to do more than simply state or describe the results they have obtained. The strongest candidates fully explained the reason(s) 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 to 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 errors may have occurred and how these might impact on their ability to draw a firm conclusion.

The ability to recognise limitations of the investigation

Most candidates addressed this area in some way and attempted to demonstrate a clear understanding of this skill by explaining the limitations of their investigations. Many candidates stated limitations only but the strongest candidates took care to fully explain how future amendments or alterations to their procedure could possibly overcome the problems which they had encountered, incorporating scientific agricultural understanding as to how their investigation was affected. However, some candidates made general statements which were not explained sufficiently to meet the marking criteria. The importance of this skill area needs to be explained to candidates before attempting to deliver the coursework.

Description of investigation, presentation, layout, and originality

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

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

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