

AGRICULTURE

Paper 5038/01

Paper 1

General comments

Although there were some very good scripts from a relatively small number of candidates, many others showed good answers on a limited number of questions. It is essential that candidates' knowledge is sufficiently detailed in all syllabus areas if a high mark is to be achieved. It was disappointing that so many candidates lacked knowledge of important topics that are fundamental to agriculture, such as soils and plant growth. There was also lack of evidence of any in-depth study or practical experience of livestock. Where a question asks for the meaning of a term, a definition is required but if the question asks the candidate to 'describe' or 'explain', more detail or qualification of points will be required. The expectation, where these terms are used, is laid out in the syllabus. The number of marks stated for a question should indicate whether an answer needs to be expanded but candidates should ensure that they answer the question set. Irrelevant material and answers that repeat the question wording will not gain marks.

Comments on specific questions

Section A

Question 1

- (a) (i) The correct order in which the diagrams showed the strokes in the four-stroke cycle was **B C D A**.
- (ii) The correct names for the strokes shown in the diagrams were: **A** – exhaust, **B** – induction, **C** – compression, **D** – power. Candidates should have been able to identify these from the positions of the valves and direction of piston movement shown.
- (b) Many candidates, able to answer other parts of the question correctly, could not give a correct response for the function of oil in the engine. 'To prevent rust' and 'to mix with petrol and burn' were common incorrect answers. The role of water in cooling the engine was better known, however.

Question 2

Knowledge about formation, structure and properties of soil, in relation to agriculture, forms a large and fundamental part of the syllabus, so it was disappointing that so many candidates seemed to have so little knowledge of this topic.

- (a) Most candidates were aware that the pH scale measures the level of acidity or alkalinity.
- (b) Many candidates were able to gain one mark by stating that many crops have a range of soil pH at which they grow best. In order to gain the second mark, it was necessary for the significance of this to be related to choice of crop, as the question asked for an explanation. There were some good answers where candidates used an example to make this point, but these were very much in the minority. There were also a few good answers referring to the availability of minerals needed at different pH values.
- (c) (i) 'Raise pH', 'reduce acid', 'neutralise acid' were all accepted answers for the effect of the addition of lime but 'make more alkaline' is incorrect, as the soil described was acidic so could only be 'made alkaline', not 'made more alkaline'. The second effect looked for, known or described by very few candidates, was flocculation of clay particles.

- (ii) Candidates needed to use the pie chart to show the proportions, on the diagram, of the components and the order in which they would settle. The correct order, with both the most and least in quantity at the bottom, was stones, sand, silt, clay.
- (iii) Many candidates did not seem to understand what is meant by properties of a soil. Qualities such as heat retention, drainage, aeration, leaching and ease of working are the type of answer looked for.

Question 3

- (a) (i) Many candidates were able to calculate that 0.4 kg of herbicide would be needed but forgot to indicate that this would be in only 50 litres of water for 0.25 hectares. Units must always be given.
- (ii) Candidates should always show their working as they may gain marks if this is correct but the final arithmetic is wrong. Here the calculation simply required the mass of herbicide needed.
- (b) (i) Generally this was well known but answers need to make points clearly if they are to be awarded marks. 'It could affect animals' or 'it could affect crops' and 'it causes pollution' are not sufficient. Toxicity, damage and the type of pollution caused should be made clear.
- (ii) Some candidates did not address the question and gave answers referring to precautions when using sprayers, such as protective clothing or position in relation to wind direction. These do not avoid or reduce spray drift, only its effects on the spray operator, so did not gain marks. The commonest correct answer was to avoid spraying in windy conditions. Other correct points related to the handling of the sprayer and its adjustment.

Question 4

It was clear from answers that many candidates have little or no knowledge of the basic genetics required by the syllabus.

- (i) The correct genotype was **Dd**.
- (ii) There were few answers that gained both marks. Candidates needed to make it clear that all the F1 hybrids would be drought resistant and that they could also have a good characteristic from the homozygous recessive parent, which was illustrated as having much larger fruits than the homozygous dominant parent. Reference could have been made to hybrid vigour.
- (iii) Some candidates misunderstood or did not read the question carefully, as quite a number of answers showed the results of crossing the homozygous parents. Many candidates correctly showed the cross of F1 hybrids ($Dd \times Dd$), giving DD, Dd, Dd, dd as offspring but, to gain full marks, it was necessary to indicate that one of these would not be drought resistant so phenotypes should be stated, as well as genotypes.

Question 5

- (a) (i) The area correctly stocked was **C** (stocking rate and carrying capacity were the same).
- (ii) Many candidates were confused by the units (hectares per livestock unit), although these are used as standard in texts. The common incorrect answer was **E**, the correct response was either **A** or **D**.
- (iii) Few candidates gained more than one mark here. The question required an explanation of the term 'overstocking', which requires a little more than a simple definition, given correctly by many candidates as 'exceeding the carrying capacity', which would gain one mark. A statement to the effect that this would result in damage to pasture was required for the second mark.
- (b) (i) This was generally well answered, with candidates stating that soil erosion could result from overgrazing, although fewer explained that this was because soil would be left exposed.
- (ii) Most candidates were able to give some idea of good quality grasses dying out as a result of damage caused by overgrazing. Good answers expanded this to describe the damage as plants are eaten to the ground and have no time to recover and some referred to the part played by selective grazing.

- (iii) Candidates generally appreciated that animals could suffer from lack of food but few mentioned a drop in yield, which should be an obvious consequence. Many answers concentrated on extreme cases of animals starving to death

Question 6

- (a) The question asked for descriptions of methods of preventing soil erosion on a slope, so a brief indication of how the methods selected would work was needed. This was seen in very few answers. Other common faults were failing to relate the chosen means to sloping ground, choosing methods inappropriate to land used for growing crops and simply trying to use the rest of the question to provide an answer, such as 'plant grass all over the slope'. Suitable methods could have included terracing (a common answer but without explanation), contour ploughing (often mentioned but with no apparent understanding of the method), grass bunds, mulching and the use of trees as windbreaks.
- (b) Descriptions of soil loss and run-off on the two slopes were required. Quoting the figures from the table, without further comment, was insufficient as the question tests the candidates' ability to understand the implication of the figures. Equally, an explanation of why there was a difference in the figures was not asked for and did not gain marks here, as this was tested in (c). The expected answer was that a large amount of soil was lost on the millet-covered slope, compared to no soil loss on the grass-covered one and that there was much more run-off on the millet-covered slope than on the grass covered slope.
- (c) There were some excellent answers, gaining all three marks, but most candidates gained two, with references to the difference in the density of root growth and of soil cover. Fewer appreciated or made clear the importance of permanent cover, rather than a crop which would be harvested and leave the soil bare for a time. A few mentioned the effect that tillage would have, in loosening the soil and making it more vulnerable to erosion.

Question 7

As with knowledge of soil, conditions concerning germination and growth of seeds is fundamental agricultural knowledge so it was disappointing that this question was so poorly answered in many cases. In parts (a) and (c) of this question, many candidates used the term 'humidity' when referring to wet or dry conditions. 'Humidity' has a specific meaning that is not the same as the presence or absence of liquid water. It should only be used in appropriate contexts.

- (a) The conditions required for germination are water, oxygen and warmth. 'Humidity' is not equivalent to 'water'. 'Temperature', without further qualification, is insufficient – some indication of a suitable temperature should be given. 'Light', 'soil' and 'fertiliser' were common incorrect answers.
- (b)(i) 'Protects seeds from excessive heat' and 'soil moisture retention' were common correct answers.
- (ii) Some candidates failed to notice that the question stated that the seeds had germinated when the mulch was removed, so answers referring to seed germination were irrelevant here. A good number of candidates realised, however, that the seedlings would have better access to light and would be less prone to fungal disease without the mulch.
- (iii) Many answers referred to protection from sunlight or sunshine. Without further qualification, this did not indicate clearly that shading protects young plants from excessive heat. Other correct answers referred to the prevention of excessive transpiration ('prevention of transpiration' was not correct) or preventing wilting.
- (c) Some candidates did not understand that the question referred to storage of seed and gave the same answers as for (a). Appropriate answers referred to dry conditions, cool conditions ('temperature' without further qualification was insufficient) or protection from insects, rats and other vermin and fungal attack.

Section B

All questions in **Section B** were attempted by a good number of candidates so that it was possible to judge the general performance of candidates in each question. Almost all candidates obeyed the rubric requirement to answer only three questions.

Question 8

This was the least popular choice of question, although still attempted by a large number of candidates.

- (a) Many of the candidates who attempted this question had little or no knowledge of ruminant digestion, although this is a clearly stated section of the syllabus. Some candidates gave a general account of mammalian digestion and some were clearly ignorant of ruminant animals, with rabbits being described as ruminants by a few. Good answers referred to the diet of ruminants consisting of a large amount of plant material although they are unable to digest cellulose. This digestion is performed by bacteria in the rumen (which also synthesise vitamins) and enable nutrients that would be lost to be absorbed.
- (b) Candidates referred to dead organic plant and animal material being decomposed by bacterial action but almost all omitted to mention that fungi also perform this role. Many candidates gave no more information than this but fuller answers mentioned the release of minerals and the important role of humus in soil texture.
- (c) This part generally had fuller answers than (a) or (b). Candidates indicated the role of nitrogen-fixing bacteria in relation to leguminous plants but fewer mentioned that they are also free-living in soil. Details of the rest of the nitrogen cycle were irrelevant and did not gain marks.

Question 9

- (a) (i) Virtually all candidates remembered to state the type of livestock that they were referring to, although a few mentioned more than one which was not what the question required.
- (ii) This was well answered, candidates gave suitable lists of products.
- (iii) It is expected that candidates will have studied one type of livestock in some depth so should be able to give details of processing of a product such as meat or milk. In the case of meat, this could include skinning or plucking, butchery of the carcass as well as storage and packing. For milk there should be some knowledge of sterilisation or pasteurisation as well as processing into cheese, yoghurt or other products for sale. Lack of any detail in answers made it clear that many candidates had only the sketchiest knowledge of any of this.
- (b) (i) The full definition of a maintenance ration is one that contains all necessary nutrients in sufficient quantity to keep the animal in good condition/without weight loss.
- (ii) Many candidates failed to state that a production ration is additional to the maintenance ration. Good answers gave an example of circumstances when a production ration would be given, rather than simply stating that it is 'for production', which just repeats the question wording.
- (c) Again, candidates showed little evidence of having studied the care of any type of livestock in depth. Better answers were often those where poultry was the example, with references to the changes in feeding throughout the birds' lives, related to production. However, these still lacked detail in terms of quantity and frequency of feeding and few candidates mentioned the importance of providing water for all livestock. Cattle were another common example but answers did not extend beyond references to milk as the first food, with mention of colostrum by better candidates, and grass as the food for adult animals. Mention of supplements or changes to feeding for pregnant animals were seldom seen.

Question 10

- (a) (i) Virtually all candidates remembered to state the type of livestock that they were referring to.
- (ii) This was not very well answered in many cases. It was expected that candidates would indicate the use of materials selected, whether for walls, roof, floor etc., so that a clear reason for the choice could be given, such as ease of cleaning where a floor is made of concrete, as well as cost/availability/durability for a given material. Some candidates listed tools rather than materials, which did not gain marks. It should be noted that 'cement' and 'concrete' are not synonymous and candidates should understand the difference.

- (iii) This description should have included the way in which the building would provide shelter and ventilation. There could also have been descriptions of provision for giving food (troughs, drinkers, etc.), as well as any provision needed for separating animals and ways the housing allowed cleaning or drainage of waste. Too many answers gave little information beyond stating that the building provided protection from the elements and from predators.
- (b) Candidates clearly had little first hand experience of using these tools. Dry storage to avoid rust is a primary requirement but coating them in oil would not make them easy to use, although it might have the same effect. Tightening or oiling moving parts are clearly irrelevant for these tools, although suggested by a number of candidates. Sharpening or re-setting saw blades was a good answer but given by relatively few candidates. Some also mentioned protecting wooden handles from rot or insect attack, again a good point.

Question 11

Candidates generally failed to address the question. Answers did not relate to the way in which the factors listed would affect crop choice but simply stated what each of the factors meant. If examples had been used in each case, as required by the question, answers would generally have been more relevant but this was not seen in many answers.

- (i) Many answers simply stated that climate referred to temperature, rainfall and wind but did not address the question. Choices related to temperature range and rainfall amount were the sort of points expected.
- (ii) Candidates referred to pH and soil properties but again failed to indicate how this would affect choice of crop. Topography was often defined but its relevance seldom explained. Points related to practicality of mechanisation on sloping land and erosion in relation to tillage or permanent crops could all have been mentioned with appropriate examples.
- (iii) 'Availability of labour' needed to be related to the labour requirement of a specific crop. Labour costs could also have been mentioned here.
- (iv) The need for good transport links was seldom related to the needs of particular crops – whether they needed to be transported in bulk to factories and would require large lorries or would need speedy transport, to avoid spoilage. The point that a crop having neither of these requirements could be chosen, if suitable transport was not available, could have been made using an appropriate example.
- (v) Candidates often referred to proximity of markets and local demand in their answers but, again, failed to illustrate points with examples.

Question 12

- (a) Many candidates gained all the marks for this section. The advantages of mixed farming were clearly understood, such as the use of animal waste as a soil conditioner, crop residue as animal feed, the spread of risk in such an enterprise, with a greater range of products and the use of animals as draught power.
- (b) (i) A few candidates were unsure about the meaning of the term 'monoculture' and many candidates could not give clear advantages. Points that could have been made were guaranteed markets, reduced capital outlay for machinery, easier planning and known labour and other requirements.
- (ii) The disadvantages of monoculture seemed better known, particularly the high risk, where the single cash crop could be lost as a result of disease, pest attack or natural disaster. Ideas about increased pest or disease build-up were often expressed but sometimes not clearly. Most candidates were aware of the depletion of the same soil nutrients with a need for increased fertiliser inputs and good answers related this to soil degradation and erosion.

(c)

Some candidates gave a detailed description of a crop rotation plan, which was not evaluated and would not gain marks on its own. A few candidates continue to confuse crop rotation with grazing. There were, however, some good answers, gaining full marks. It should be noted that crop rotations maintain, rather than increase, soil fertility, especially where legumes are included. Many candidates outlined the importance of a legume in a rotation. Reduction of pest and disease problems was mentioned in many answers but fewer explained this with reference to breaking life cycles as crops are changed. Some candidates referred to prevention of soil degradation/erosion but this was seldom expanded upon. Reference to different rooting depths taking nutrients at different levels and also preventing soil pans could have been included.

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Paper 5038/03

Practical

General comments

Once again all candidates attempted all parts of every question - indicating that there was sufficient time allocated for the examination. There were no cases of candidates infringing the examination rubric.

Again, some candidates continue to provide responses for practical questions by stating what they thought should be the outcome, as opposed to describing their actual observations. This was especially noticeable in the candidates' responses to **Question 3**.

No Centre described difficulty in providing the necessary apparatus or reagents.

Comments on specific questions

Section A

Question 1

- (i) Most candidates suggested an appropriate reason for filtering soil water before testing for pH.
- (ii) More able candidates provided a suitable description of how they tested the soil samples. Weaker candidates answered the question inappropriately by describing the results of the experiments. The most common misconception was the statement that litmus was used instead of universal indicator. Few candidates described the need to allow the tests to settle.
- (iii) Many candidates were able to carry out the experiments appropriately and complete the table with the correct colour changes. Fewer candidates were able to correctly link the colours with pH values.
- (iv) This question was answered well.

Question 2

- (a) (i) Despite the lengthy instructions, most candidates were able to set up the experiment correctly and consequently were able to measure the distance correctly.
- (a) (ii) Most candidates provided a suitable drawing of the cards and further, labelled it correctly.
- (a) (iii) Fewer candidates were able to find the centre of gravity of the object. There was some understanding of the concept by nearly all candidates, but putting this into practice was not performed other than by the stronger candidates.
- (b) (i) Most candidates provided a suitable drawing of the cards and further, labelled it correctly.
- (b) (ii) Again fewer candidates were able to find the centre of gravity. Fewer candidates attempted this question than the previous centre of gravity question.
- (c) Only the most able candidates were able to describe how to lower the centre of gravity of an object.

Question 3

- (a) Most candidates were able to perform the iodine test for starch correctly. Slightly fewer candidates were able to correctly perform the test for protein. The Benedict's test for reducing sugars was performed less well by candidates in general. From some responses, it was clear that some candidates tried to attempt this question without performing the practical test.
- (b) This question was answered well
- (c) (i) Only the stronger candidates were able to suggest a use for the food supplement AS4. Weaker candidates did not suggest a use for the supplement, but repeated the conclusions about their tests.
- (c) (ii) Only the stronger candidates were able to provide a reason for their suggestion.