

# AGRICULTURE

Paper 5038/01

Paper 1

## General comments

It was pleasing to see many candidates responding well to the questions. All appeared to have time to complete both sections and almost all followed instructions, in terms of where to answer **Section A** and how many questions to answer in **Section B**. Reading the information on the front of the paper, before a candidate starts to answer, is time well spent. Candidates must also read the questions carefully and ensure that their answers are relevant. If a question asks for **one** example, giving a list will not gain extra marks and may actually lose marks, as correct answers will not be selected from such a list. Such an answer does not clearly demonstrate the candidate's knowledge. In **Section A**, candidates should expect to apply knowledge in unfamiliar situations, where data or information is provided, as in **Questions 3 and 6**. Candidates gaining higher grades are able to do this and do not rely solely on recall of information. Many answers suggest that candidates lack practical experience of growing crops or keeping livestock, on a large or small scale. Greater practical experience is likely to enable candidates to apply their knowledge better in questions such as those mentioned. In **Section B**, candidates are expected to sort their knowledge and extract the relevant information in order to answer the questions set. Long answers, where candidates write all that they know about a topic without selecting relevant information, are often counter-productive as time is wasted in writing material that gains few marks.

## Comments on specific questions

### **Section A**

#### **Question 1**

- (a) Candidates did not show good knowledge of the correct use of their chosen tool, nor of seed bed preparation in general. This suggests, disappointingly, that many candidates have little practical experience of growing crops. An explanation required a reason for the use of the chosen tool, as part of seed bed preparation. The hoe, **A**, may be a multi-purpose tool but the other implements have specific uses. The spade, **B**, is a tool of primary cultivation, for digging and turning soil, burying weeds and in the process, exposing insect eggs and larvae. The fork, **C**, is a tool of secondary cultivation. It may be used to dig and break up hard ground but is generally used to break soil to a finer texture, improving drainage and aeration in so doing. The rake, **D**, may be used for removing debris, but not for weeding. It produces a fine tilth and levels the soil.
- (b)(i) There were good accounts of rust prevention – cleaning and drying after use, oiling the metal to avoid exposure to oxygen and water and dry storage.
- (ii) Answers were varied but most suggested that insects such as termites, rotting or exposure to extremes of temperature were likely to damage the wooden part of tools.
- (iii) Suggestions of how to prevent these problems were less clear. A description required some detail of wood treatment or how to maintain storage free of insects, for example, and should have been related to the answer in (ii).

#### **Question 2**

- (a) (i) and (ii) The majority of candidates named a ruminant and non-ruminant correctly.

- (b)(i) All candidates remembered to state which animal they had chosen. This is essential for a mark to be awarded. **One** main purpose for keeping the animal was required, for example milk for cattle or eggs for poultry.
- (ii) In the examples in (i), a by-product might be hides or skins for leather from cattle or feathers from poultry.
- (c) Many candidates seemed unable to state the uses of the dietary constituents. The main need for iron is in haemoglobin in red blood cells. Good answers mentioned the prevention of anaemia but many candidates did not seem to be aware of the importance of iron. Protein's function, in growth and repair of tissues, was better known and some answers also mentioned its importance in named production, such as meat or eggs. Answers on the importance of water were generally poor, with little specific information beyond mentioning temperature control. It is a main constituent of all cells, as well as blood and digestive juices and is essential for excretion and production, of milk or eggs, for example. Frequently seen answers such as, 'It aids digestion', are too vague to be accorded a mark as they do not indicate any real knowledge on the part of the candidate.

**Question 3**

- (a)(i) Seed rate is the quantity of seed sown over a given area. It may be expressed as the quantity of seed sown in kg per hectare but 'the number of seeds per hole' is not correct.
- (ii) This question asked candidates to apply their knowledge of **germination** requirements to the situation illustrated. Light for photosynthesis and a supply of nutrients in the soil – common incorrect answers - are **not** needed for germination. However, water is needed so the presence of the trees, removing water from the soil or preventing rainfall reaching the ground close to them, would create the dry conditions that would result in poor germination.
- (iii) This part of the question referred to growth following germination so references to competition from the trees for water, minerals and light were appropriate answers here. Only two reasons were required and candidates generally completed this section satisfactorily.
- (b)(i) This was a question of simple economics. Sowing an area that would produce little return would be a waste of seeds and therefore money. There were some very good answers but too many others were irrelevant, such as suggesting that the area was left fallow to recover its fertility.
- (ii) The majority of candidates gave good answers here, referring to the trees acting as a windbreak or preventing erosion.

**Question 4**

- (a)(i) Most candidates understood that the allele controlling the polled condition would be dominant. A few answers were 'homozygous' but an allele cannot be thus described. Candidates need to be sure that they understand the definitions of terms.
- (ii) A symbol for a particular allele should consist of a single letter. The convention is for the dominant (polled) allele to be upper case and the recessive (horned) allele to be lower case, both the same letter, e.g. P and p. A few candidates used X and Y. This is inappropriate, as the convention is to use these to denote inheritance of gender. Using the example P, p, the genotype of the bull would be PP, that of the cows would be Pp and the calves would be pp.
- (b)(i) A full answer required candidates to show the cross Pp x Pp (or the letters chosen in (a)(ii)), which would show that 25% of the calves might be expected to have horns (genotype pp):

	P	p
P	PP	Pp
p	Pp	pp

- (ii) Most candidates gave a correct answer, the commonest suggestions being that polled cattle would pose less of a danger, of injury or damage, to the farmer or other cattle.

### Question 5

- (a) This was a simple calculation that most candidates were able to perform correctly:

$$1 \text{ hectare} = 100 \text{ m} \times 100 \text{ m} = 10\,000 \text{ m}^2$$
$$\text{amount of lime required} = 0.3 \times 10\,000 \text{ kg per ha} = 3\,000 \text{ kg per ha}$$

- (b) The question asked for the effect of lime on the soil **pH**. Some candidates failed to notice this, giving answers such as, 'It would be less acidic'. The correct answer was that the pH would be increased. It is essential that responses answer the question precisely, so that a candidate's understanding of the subject is clearly shown.
- (c) Some answers were too imprecise to warrant a mark. 'To improve fertility' was the gist of many such answers. Good answers referred to improving the availability of minerals to a crop or allowing a greater range of crops to be grown. All answers had to relate to a change of pH, as required by the question.
- (d) The answer here needed to be a benefit **other than** a change of pH. A clay soil was specified, leading candidates to the idea of flocculation of clay particles, thus improving drainage and aeration. A statement **and** an explanation of the benefit were needed for a full answer. The benefit could be stated as *flocculation*, the explanation would then be that it improves drainage/aeration. Alternatively, a candidate might state that improved drainage/aeration is the result of adding lime and go on to explain that this would result in improved root respiration and, consequently, plant growth. Both answers are acceptable as they both show good knowledge and understanding by the candidate.

### Question 6

- (a) Candidates needed to use the information provided, about a potentially unfamiliar plant pest, applying knowledge that they should have, about the problems posed by insect pests and their solutions. They were told that the insect punctures leaves to feed on sap and lay eggs inside the leaf. Candidates should know about other piercing and sucking insects, which could act as vectors of disease and also allow pathogens into the plant via the puncture wounds. This would provide the answer here.
- (b) Since candidates were told that damage done is to the leaves, they should have been able to deduce that this would result in less photosynthetic area, consequently less food made and so reduced yield. There were good answers that made these points.
- (c) (i) A simple statement, that predators control pests by feeding on them, was required for the mark and was given by most candidates.
- (ii) Some candidates seemed unsure about what is meant by *systemic insecticide*. Those who understood explained the difference between this and a contact insecticide, with good answers including the information that the contact insecticide was less likely to come into contact with the insect and would only affect the adults on the surface of the leaf, not the larvae inside the leaf.
- (iii) Most candidates understood that pesticides may be toxic. Candidates might also bear in mind that organic production, which is becoming an important commercial consideration, would prohibit their use. No-one mentioned this.
- (iv) Again, the question directed candidates to apply their knowledge to the information provided earlier in the question. Many candidates did not do this, nor did they note that the question required ways other than pesticides or predators for dealing with the problem. Since the life-cycle, illustrated in the diagram, showed a soil-living stage, crop rotation, a fallow interval or ploughing between crops to expose larvae would all have been good suggestions. Early planting or weed control were accepted, as were appropriate field hygiene measures but 'bush burning' does not suggest that the candidate has real knowledge or understanding of the subject.

### Question 7

- (a) (i) The correct order was (B), C, D, A.
- (ii) Part X was the outlet (or exhaust) valve.
- (iii) Some candidates failed to note that function, rather than name, was required here. Reference to production of a spark or ignition of the air-fuel mixture would have gained the mark.
- (b) (i) Too many answers gave vague generalisations about 'greater efficiency' or 'easier work'. 'Efficiency' needed to be qualified in terms of time-saving and 'easier' in terms of cultivating large areas or timely harvest. A reduction of labour costs was also an accepted point.
- (ii) Answers here were better, with costs of mechanisation and damage to soil structure of heavy equipment being the commonest correct answers seen. 'Pollution' is insufficient. References to air pollution would be needed for this to be considered for a mark.

### Section B

### Question 8

- (a) Descriptions of rotational grazing were often unclear and there was seldom mention of fencing. An **annotated** diagram can make an answer clearer, showing the sequence of grazing the different areas. Some candidates do seem to confuse rotational grazing with extensive systems where cattle are moved from place to place over large range lands. There were a few candidates who confused rotational grazing with crop rotation.
- (b) Control of parasites was mentioned by many but the best answers realised that this depended on breaking the life cycle of such pests. Time for recovery of pasture, reduction of overgrazing and erosion were all included in many answers but few mentioned that pasture could be more easily improved or that selective grazing would be reduced.
- (c) Conservation of forage seemed to be unknown to some candidates who attempted this question. Making hay and silage were the obvious (if not the only) responses and some detail of method, for any form of conservation mentioned, was required.

### Question 9

- (a) (i) This was often well answered, with responses mentioning the same nutrient demands leading to nutrient exhaustion and the life cycle of pests not being broken. However, some candidates' response was simply 'the soil would become less fertile'. This needs explanation to demonstrate understanding.
- (ii) There were some excellent answers, describing the effects of different rooting depths as crops are rotated and explaining how crop rotation overcomes other problems described in (i). A brief explanation of the meaning of *crop rotation* clarified answers and was validly included but a lengthy, illustrated description was not asked for and would reduce the time available for a candidate to include relevant material.
- (b) Most of the information should have been on the diagram, as required by the question. There were some very good answers, with accurate diagrams demonstrating that candidates had good knowledge of the nitrogen cycle. The inclusion of and correct direction of arrows was essential, the latter being a common source of error.

### Question 10

- (a) Definitions of transpiration should specify the loss of water **vapour**, referring also to the part of the plant involved and loss to the **atmosphere**.

- (b)(i) Most answers correctly stated that rate of transpiration increases as temperature increases. A full description needed to include the effect of temperature on the water potential gradient between the inside and outside of the leaf, in terms of evaporation.
- (ii) Many answers explained what *humidity* is and went on to state that high humidity results in low transpiration but could have expanded this further, in terms of water potential gradient, as in (i).
- (iii) Answers here lacked explanation of water potential differences, as above but generally stated correctly that transpiration increases with wind speed. Again, candidates should note (as in (a)) that it is water **vapour**, not droplets, that is moved away from the leaf surface.
- (c) This was often poorly answered. Cooling the plant was a valid answer but was often the only point made. The effect of transpiration, drawing water from the soil to flowing through the xylem to all parts of the plant and carrying minerals, should have been outlined to give a complete answer.

#### Question 11

- (a)(i) The question did not ask how suitable housing is achieved but how it would help to prevent disease. Many candidates concentrated on stockmanship – cleaning housing – rather than on the nature of a good animal house – protection from adverse weather, maintaining a suitable temperature, providing ventilation – which would make animals less susceptible to disease as they are in good conditions. Hence marks were lost, as answers were not relevant.
- (ii) Many candidates simply stated that providing clean water would reduce disease. This information was given in the question. At the very least, answers should have included the information that dirty water might contain disease-causing organisms as well as being a breeding ground for vectors of disease.
- (iii) Many candidates included reference to insects as vectors of disease but the best answers gave examples and also pointed out that skin irritation, caused by insects, might lead to skin damage and the entry of bacteria.
- (iv) Candidates who answered well realised that old stock are often carriers of disease and that younger stock may be more susceptible, as their immune systems are less developed. Ensuring that young stock receive correct rations and reducing injury by larger animals were also mentioned in the best answers.
- (b) The question made it clear that these animals were breeding stock, not simply kept for meat production. The question also stated that these were healthy animals, so answers that referred to prevention of disease missed the point. Those candidates who understood these points were able to make sensible suggestions, referring to lack of fertility, poor-quality products, poor breeding quality and poor returns on costs.

#### Question 12

- (a)(i) A common error continues to be that *cultivar* refers to machinery. The correct definition is 'a variety of a type of crop plant'.
- (ii) This was often well answered, candidates mentioning yield quality and quantity, marketability, disease and weather resistance. Good answers would relate these to consideration of local conditions. Pest and disease resistance would also be a valid consideration. 'Costs' needs some qualification to justify a mark – in terms of inputs or cost of seed, for example.
- (b) Too many answers gave wide-ranging lists of farm diaries and records without relating them to the question so much material was of no obvious relevance. The question required answers to give reasons for the importance of the records mentioned, which could include sowing and harvesting dates, inputs needed with examples and costs, the yield and returns from sales.

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Paper 5038/03

Practical

All Centres appeared to have no problems with the practical test paper. Candidates performed well on all questions. Questions one and two acted as good discriminators and resulted in some excellent answers.

Most candidates attempted all sections of the paper and showed a good understanding of the specification. It was pleasing to see how candidates were able to apply their subject knowledge when analysing the practical test results.

Some Centres experienced some problems in setting up soils with an appropriate pH although guidance was provided to allow Centres to adjust the pH of their soils accordingly. Where Centres were unable to obtain the desired pH the marks were awarded according to the pH on the Centre Supervisor's report.

It is important that Centres always fill in the appropriate information on the Supervisor's report.

## Question 1

- (a) (i) Candidates were able to describe the soils using the simple but effective finger-rubbing test, a few candidates were able to describe the soil but ticked the wrong boxes with regard to properties.
- (ii) It was pleasing to note that most candidates were able to apply their knowledge to identify soil properties and relate them to growing a large fruit tree in a windy area; many identified the need to use the heavier soil.
- (b) This somewhat unfamiliar experiment was again carried out effectively, however some candidates found considerable difficulty in drawing the bar chart showing their results. Candidates must remember to label the X and Y axis clearly and accurately plot the bars.
- (c) (i) Generally candidates were able to carry out the test and gave a colour appropriate to the colour of their sample. Marks were awarded for a pH that was +1 or -1 of the pH stated on the Supervisor's report. Some candidates made reference to brown or grey liquid which suggested they failed to allow the samples to settle or added insufficient barium sulphate.
- (ii) Many ways to raise the pH of AS1 were suggested, and any correct answers credited. Explanations tended to be vague but generally appropriate.

## Question 2

- (a) (i) It was pleasing to see that many candidates were able to distinguish between samples containing no glucose, a small amount of glucose and high glucose.
- (ii) Almost all candidates identified AS5 as having the most glucose, even when in the previous answer they had not gained full marks.
- (b) For most Centres candidates gained full marks with AS6 identified as containing starch and AS7 no starch. The results of a few Centres appeared to indicate that samples may have become contaminated.

## Question 3

- (a) Almost all candidates provided a clear diagram of a spark plug and the majority were of an excellent standard. Where candidates were only able to label one or two or even no parts, one mark was awarded for a clear diagram. Most candidates labelled three parts with a name appropriate to the part labelled.

- (b) A wide range of answers was given; marks were awarded for any appropriate answers. It was good to see that candidates were able to apply their scientific understanding when answering a question about farm machinery.