AGRICULTURE

Paper 5038/01

Paper 1

General comments

Many candidates lost marks unnecessarily because they failed to read the questions carefully so that answers were not relevant. Answers should show a real understanding of the subject and knowledge that the candidate can use to solve problems and make valid suggestions in unfamiliar situations. The examination is not a test of rote-learned facts that the candidate does not really understand and cannot apply. It is clear that many candidates have little experience of practical agriculture. Whilst circumstances may make this difficult, it is vital that candidates have as much opportunity as possible to see (and take part in) the raising of crops and animals, on however small a scale, as this is likely to increase understanding and quality of answers.

Comments on specific questions

Section A

Question 1

It was disappointing that a significant number of candidates were unable to complete this question, since knowledge of soils is of paramount importance in agriculture and this should have been a straightforward start to the paper.

(a)(i) The correct labels on the diagram were: **A** – top soil, **B** – subsoil, **C** – parent material. 'Horizon A' etc. simply repeated the labels given and did not gain marks.

(ii) The correct answer was **A** or 'topsoil'.

(iii) The reason that most roots would be found in layer **A** is that the highest proportion of mineral nutrients and air would be found in this layer. Mentioning one of these would be sufficient for the mark but candidates should use comparative terms such as 'more' or 'larger amount' in answering questions like this as there is a comparison being made with the other layers. Candidates should avoid using the term 'food' when referring to mineral salts in the soils. 'Minerals' or 'mineral salts' are also preferable to 'nutrient', as they are less ambiguous.

(b)(i) The correct answer was soil **X**.

(ii) This answer also required a comparison. Of the three soils, **X** had the highest proportion of sand and gravel, which are large soil particles compared with clay and silt. A full answer required an explanation that there would be larger (not 'more') air spaces and this would enable water to drain freely.

Question 2

(a) Few candidates seemed able to relate the four sets of conditions listed with the appearance of the four trays of seedlings in the diagram. The correct order was **B** (water and light all around), **A** (water, no light), **C** (water, light from one direction), **D** (light all around but no water).

(b)(i) Most candidates correctly gave the process as photosynthesis, although a few confused this with phototropism.

(ii) The question asked for a word equation. Candidates were not penalised if they used chemical formulae, provided these were correct. For example, CO_3 instead of CO_2 could not be given a mark. Thus, candidates may penalise themselves, and certainly make the question more difficult, by not following instructions. It should be noted that 'food' is not an acceptable alternative to 'carbohydrate', or a suitable named example, as a product of photosynthesis.

(c) There were many good answers stating that seeds had stored food reserves, naming the structures in which they are found and how they are used to enable germination to take place. However, a substantial number of candidates thought that seeds take minerals from the soil in order to germinate. There were also answers giving reasons why seeds could not photosynthesise. These did not gain marks as they repeated much of the information given in the question and did not answer the question set.

Question 3

(a)(i) The correct choice was **A**.

(ii) Most candidates realised that the high protein content of **A** was the identifying feature.

(b)(i) The correct answer was 450 × 2/100 = 9 kg. It is important that candidates show their working as a mark may be gained for a correct method, even if the final answer is incorrect because of an arithmetical error.

(ii) Far fewer candidates were able to answer this correctly. The correct answer, for the additional quantity, was 2.25 kg, that is ¼ of the normal ration needed by the animal. A large number of candidates found the total ration needed for the lactating animal (11.25 kg) but failed to notice that the question required the additional amount to be stated. Careful reading of the question is essential.

(iii) The definition of lactation looked for was the production of milk (by a female mammal) after the birth of, or for a young animal. There was confusion, in some cases, with weaning and also with the first milk produced (colostrum).

(c) Surprisingly few candidates could give the correct name for this additional ration – the production ration.

Question 4

Many candidates did not appear to have read the information given in the question carefully. It was common to see genetic diagrams that had clearly been learned by heart but which were not really relevant to the answers required. Candidates should beware of formulaic, rote-learned answers and read the question carefully.

(a) Very few candidates noted the significance of the fact that these plants were raised from cuttings from the same parent plant. Only a small number pointed out that this is asexual reproduction, (not involving pollination, fertilisation or fusion of gametes), so all offspring would be genetically identical to one another and to the parent plant. The large number of references to cross-pollination showed that candidates had not understood this. The statement that the plants came from a single parent plant was not sufficient for a mark, since sexual reproduction could still occur in these circumstances and produce a mixture of offspring phenotypes. It was essential that candidates clearly understood the difference between this and plants raised by asexual means from the single parent plant.

(b) Candidates needed to show that the identical parent plants would have to be heterozygous (Rr) in order to produce plants with white flowers. References to F1 and F2 generations were irrelevant and did not demonstrate a real understanding of the question. A diagram of the cross, most candidates' preferred method of explanation, should have shown the parents, Rr x Rr and the gametes and offspring, as in the punnet square here (alternative diagram forms are acceptable).

	R	r
R	RR	Rr
r	Rr	rr

The phenotypes of these offspring should also have been stated, to complete the explanation and thus gain full marks.

(c) The expected answers were ¼ or 25% (white flowers). Some candidates gave a ratio of 3:1. This could only be accepted if it was clear that this meant 3 red-flowered plants to 1 white-flowered.

Question 5

This question was very well answered in many cases and a good number of candidates gained full marks. Greater care in interpreting the graph and in reading the question would have increased this number.

(a)(i) Most candidates understood that the crop yield would be reduced. The use of comparative terms is important, so 'the crop yield would be lower' is a good answer whereas 'the crop yield would be low' does not clearly indicate understanding.

(ii) The two numerical answers, reading from the graph, were 8 (%) and 80 (weeds per m^2). The majority of candidates gained both marks. A few lost marks by reading the scales incorrectly – a careless error that could be avoided.

(b) This was generally very well answered, with answers mentioning weed competition for water, minerals and space, shading crops and harbouring pests and diseases.

(c) Good answers gave specific weed control measures, such as hand pulling, hoeing, mulching, early planting, maintaining crop cover (including inter-row cropping) and even crop rotation, which is appropriate for control of some weeds. Some answers were too general to be given a mark, e.g. 'biological' or 'cultural'. 'Cultivation' is not an adequate answer. It requires reference to a specific operation, such as digging or ploughing to bury weeds. Failure to read the question carefully, which asked for methods <u>other than</u> using herbicides, cost some candidates a mark, as this was an answer that they gave.

Question 6

This question was also very well answered, again with many candidates gaining maximum marks.

(a)(i) Structure **C** was the oviduct/fallopian tube (either term was accepted).

(ii) Fertilisation occurs at **C**.

(iii) Structure **A** (ovary) produces eggs and hormones (a correctly named hormone produced by the ovary was also accepted). Only one of these functions was needed for the mark. The term 'ovum' or 'ova' is correct for 'egg(s)' but 'ovule' is not as this is the <u>plant</u> structure that develops into a seed.

(iv) The fetus develops in structure **D**.

(b) A few candidates lost marks because they failed to follow the instruction to give a **different** reason for using each material. Some answers were too general and vague to gain a mark, for example describing a building material as 'resistant' has little meaning unless the answer specifies what it is resistant to. 'To prevent rain getting in' is a reason for a roof, not for choosing one material in preference to another. Reasons such as cost, availability, durability, strength in terms of preventing animals damaging it and ease of cleaning were the sort of answers looked for. Some of the best answers made a comparison. For example, where corrugated iron was suggested for the roof, the reason given was that it was less likely to catch fire than thatch.

Question 7

This was a challenging question that required candidates to apply their knowledge to an unfamiliar situation. It was pleasing that many candidates were able to give well thought out answers and make intelligent suggestions.

(a) 'Reducing imports' and 'reducing amount of income spent on food' were the two commonest answers, as well as 'reducing food shortages' and 'improving access to fresh vegetables'. Suggesting that people who grew vegetables in this way could sell the surplus was a good idea but that they could export to other countries was not realistic as this was clearly small-scale production that would only supply enough for local needs. 'Freeing agricultural land for development' also missed the point of the question.

(b) Very few candidates seemed to understand the principal of growing in the trays, using a soil-less medium and fertiliser solution. The few who grasped this mentioned the cheapness of the groundnut shells and that they would otherwise be thrown away, so were being recycled. Their light weight would also have been a good answer, in the context in which they were used.

(c) Any suitable mineral, such as nitrogen (nitrate) or phosphorus (phosphate), was accepted.

(d) Many candidates were able to explain that leafy crops need a higher proportion of nitrogen, for good leaf/vegetative development and fruiting crops need more potassium for fruit/flower development. There were, however, a substantial number of candidates who were unable to give this basic information correctly. There was also confusion over the term 'fertiliser', where some candidates clearly did not make the distinction between this, herbicides and pesticides. Reference to 'selective fertiliser to kill insects' was made in a number of answers.

(e) Again, it was pleasing to see many good answers, where candidates were applying knowledge to the situation described. Many mentioned rooting depth, where maize, as a deep-rooted crop, would not grow well in the shallow trays and where this, together with the windy situation likely to prevail on roofs and balconies, would lead to difficulties in supporting a tall crop and avoiding damage to it.

Section B

Question 8

(a) Most candidates who chose to answer this question were able to name correctly the four chambers of a ruminant's stomach. However, the detail of the function of each was less well known. A surprisingly large number seemed unaware of the role of bacteria in the rumen, a vital aspect of ruminant digestion. There also seemed to be some confusion about the abomasum, with a significant number believing that digestion ends here and food is absorbed, whereas normal enzymatic digestion begins here.

(b) (i) Most who answered the question gave a fair account of rotational grazing, but the use of fences to divide the land and the sequence of events were not always very clear. Many candidates drew a diagram, but this needs good labelling or other annotation if it is to gain marks as part of the explanation. A few candidates confused rotational grazing with rotation of crops, so their answers were not relevant to the question.

(ii) Answers were often rather vague, along the lines of 'the farmer has better control of his animals'. If this is to gain a mark there should be an indication of what is being controlled and why this type of grazing favours this. More obvious and precise answers would be the reduction of overgrazing, selective grazing, erosion and parasite infestation, together with the facility to plan or set aside grass for the dry season, to improve grassland, control mating and introduction of disease from other herds, which could occur more easily in extensive systems.

Question 9

(a)(i) Correct examples, such as 'locust' or 'grasshopper', were given but many candidates also gave 'caterpillar' as a biting and chewing pest. Although this was accepted as correct, it would be better if candidates could be more specific in naming an insect pest – a particular type of moth or butterfly whose larvae feed on a specific plant.

(ii) Aphid was the commonest correct example given but some candidates thought that bees and butterflies are piercing and sucking pests.

(iii) This seemed to be the least well known but many candidates were able to name the maize stalk borer or a weevil as an example.

(b)(i) There were some excellent accounts of life history of one of the pests named in **(a)**. Candidates gave sufficient detail about egg-laying, moulting, whether the insect showed complete or incomplete metamorphosis and the larval, pupa or nymph stages, as appropriate. However, a significant number clearly knew nothing about the pests that they had listed. There were descriptions of caterpillars laying eggs, which then produced larvae, for example, and aphids producing larvae and pupae.

(ii) A good answer would indicate the part of the plant attacked by the pest, symptoms of attack and the effects that this would have. For example, aphids pierce cells on the soft parts of stem and leaf, sucking out the cell sap. They may introduce virus disease – symptoms could be given – and their honeydew causes moulds. Pests that eat leaves reduce photosynthesis and consequently yield, symptoms such as holes in leaves might be seen. Answers that simply state, 'the plant is weakened', 'it wilts' or 'it is damaged' are insufficient.

(iii) There was some confusion here, as in other questions over the terms, 'insecticide', 'herbicide' and 'fertiliser' when describing chemical control. There were good responses, however, which mentioned the appropriate type of insecticide – systemic, contact etc. – related to the pest named. It should be noted that crop rotation is not a means of pest control that will work for all insect pests. It is generally more appropriate when the pest undergoes a stage in the soil, for example where eggs are laid that will hatch to produce the larval form that eats the plant. If the damaging stage is the adult flying insect, crop rotation has little effect. The question required the answer to relate to a specific pest. Candidates should note this when answering the question.

Question 10

(a)(i) There were some very good descriptions of water uptake, including the role of the root hairs, osmosis and the movement of water down a water potential gradient. Candidates should be careful when describing concentration gradients. 'Higher concentration' and 'lower concentration' need qualification so that it is clear that the candidate means either the 'concentration' of water molecules or the concentration of the solutions inside and outside the cell. Using 'water potential gradient' could eliminate many ambiguities that may lose marks.

(ii) Xylem was correctly mentioned in many answers, although a few confused it with phloem. There was some accurate structural detail of the xylem vessels as dead cells, forming a tube-like structure. The movement of water, from cell to cell, to reach the xylem was often missed and it was not always clear that the xylem is a continuous tissue throughout the roots, stem and leaves.

(iii) There were some detailed answers but the detail was not always accurate. Most candidates stated that water is lost as vapour but some thought transpiration is water lost as droplets, whilst water lost as vapour is evaporation, not realising that evaporation is an essential part of the transpiration process.

(b) Many candidates answered this as the importance of water in a plant, whereas the question asked for the importance of water <u>flow</u> through a plant. Hence the points that gained marks, cell turgidity and plant support, the transport of mineral salts and the cooling effect of transpiration were omitted in some answers. This is another instance of candidates not reading the question carefully enough and ensuring that their answers are relevant.

Question 11

(a) There were some excellent answers relating to both usage and storage of farm chemicals. The use of protective clothing, retaining original containers, the importance of labelling and reading instructions, secure storage and care in mixing, avoiding use in windy weather, and care in disposal were all among the valid points made.

(b) Candidates seemed much less certain of the particular points relating to the use and storage of inflammable fuels. Candidates could offer little beyond cool, dry storage and keeping away from fire or flames. Repeating the points made in **(a)** would not gain further marks. The volatile nature of fuels, leading to the danger of fire and explosion, did not really seem to be understood. Actions to avoid a build up of vapour could have been mentioned and linked with the methods of, and reasons for, avoiding spillage.

Question 12

(a)(i) The question was specific about <u>hand</u> tools used to produce a fine tilth, on land that contained the remains of a previous crop. Tools used to clear uncultivated ground or to sow seeds or implements such as ploughs and harrows were, therefore, not appropriate. The obvious tools would be a spade, (or its equivalent), a fork and a rake.

(ii) Candidates seemed unsure about the correct purpose for the tools named, indicating a lack of practical experience in many cases. This is a pity, as this is a practical subject and this would be an opportunity to show knowledge gained from first hand experience. A fork is not an implement that can efficiently invert the soil but it can break large clods, thus aerating the soil, and can be used to mix in fertiliser or manure. If a rake is used to 'remove rocks' as a number of candidates suggested, it would be unlikely to last for long.

(iii) Descriptions of care of tools were generally good. The importance and methods of preventing rusting were stated. Drying a tool after cleaning is preferable to leaving it to dry, as the latter could lead to rusting. Many candidates also described care of wooden parts of tools and using the tool for its correct purpose was also mentioned, in spite of some inappropriate uses stated in **(ii)**.

(b) This was poorly answered by the majority of candidates, with little indication of knowledge of the function of ploughs and harrows. Some stated that a tractor would do the work of one or all of the hand tools, whereas a tractor is simply a means of pulling an implement such as a plough. It was expected that candidates would list a plough as the alternative to a digging tool such as a spade and a harrow for a fork or rake.

AGRICULTURE

Paper 5038/03

Practical

General comments

All candidates appeared to be able to answer all questions within the time allowed, and all the questions appeared to be accessible to the candidates. Whilst the paper produced a wide range of marks, most candidates were able to gain marks on each question. Centres should be congratulated for setting up the transpiration experiment in **Question 1**, which for some may have been a new approach. The practical requirements of the paper appear to have been competently met by all Centres.

Question 1

(a)(i) This was well answered with almost all candidates drawing appropriate leaf changes and concisely describing the results.

(ii) Generally well answered, but not all candidates gave a full range of answers and some failed to explain results in terms of water loss.

(b)(i) Again, well answered, but in a few cases candidates gave only one response.

(ii) Candidates were either able to do this or totally at a loss and produced some very strange calculations. The ability to calculate percentage loss can be used in a range of investigations and Centres are advised to prepare candidates as to how to carry out this type of investigation.

(iii) Very few candidates understood the concept of reweighing a sample until no more weight was lost.

Question 2

(a)(i) and **(ii)** Candidates either performed this test well or, in some cases, colours bore no relationship to the pH of the sample. A pH range tolerance of +/- 1 was allowed, and where Centres had prepared samples outside the range, the Mark Scheme was adjusted to +/- 1 of the pH offered by the Centre.

(iii) Most candidates had some idea, but failed to develop the explanation to score full marks.

(iv) Most candidates were able to name another substance that could be used to raise the pH of soil.

(v) Generally well answered, but in the case of a few Centres, candidates only quoted raising pH without explaining the advantages.

Centres should be encouraged to make candidates aware of the colours in relation to pH of soils.

Question 3

(i) Generally correctly answered, although some candidates also described a positive glucose result for **AS8**, which might suggest contamination of the sample during the practical.

(ii) This was either answered correctly, with better candidates noting the degree of colour change between the two samples, or interpreted as a continuation of **Question 3 (i)**, with references being made to Benedict's solution.