BIOLOGY (US)

Paper 0438/11
Multiple Choice

Question Number	*Key*	*Question Number*	*Key*
1	**C**	21	**C**
2	**B**	22	**D**
3	**A**	23	**A**
4	**A**	24	**A**
5	**D**	25	**A**
6	**B**	26	**D**
7	**B**	27	**C**
8	**B**	28	**D**
9	**C**	29	**C**
10	**A**	30	**A**
11	**B**	31	**A**
12	**C**	32	**D**
13	**C**	33	**A**
14	**D**	34	**C**
15	**A**	35	**A**
16	**B**	36	**B**
17	**D**	37	**A**
18	**C**	38	**A**
19	**C**	39	**B**
20	**A**	40	**C**

General comments

In general, candidates demonstrated considerable competence when answering questions on this paper.

Comments on individual questions

Question 8

Candidates were very sound in their knowledge of the sequence showing increasing complexity from cell to organ system. Only a very few were unable to place cell and tissue in the correct order, and this question proved to be the easiest on the paper.

Question 9

This question demanded careful inspection of the diagram allied to a knowledge of the difference between plant and animal cells. The two plant cells were most frequently identified by their cell walls.

Question 23

Almost a quarter of the candidates thought that the blood flow at Z would 'remain constant'. Perhaps they saw it as being constant with that at Y, rather than as a result of vasoconstriction at X.

Question 24

There seemed to be some belief that, after a protein-containing meal, the urea levels in the blood leaving the liver, and in the urine could not both be high. It is appears to some extent to reflect the problems candidates have with their knowledge of nitrogenous excretion.

Question 25

It was, perhaps, a little surprising that almost a third of the candidates appeared to dismiss the response to gravity clearly shown by the seedling in Experiment 1. It may be that, since Experiment 2 had a stimulus (light) *added* to the second diagram, this led several of the weaker candidates to believe that this must be the answer and it may be a case of insufficient analysis of the information provided before selecting an answer.

Question 37

This was one of the very few questions on the paper where more candidates chose an incorrect answer rather than the correct one. It seems that they failed to appreciate that water is just as important as carbon dioxide as a requirement for photosynthesis, and that water, as well as carbon dioxide is released during respiration. It is likely that this was the result of a lack of careful thought rather than a lack of biological knowledge.

Question 38

The phases of a population growth curve are clearly not well understood. Candidates who performed well on the paper had no problems, but the rest, a clear majority, resorted to guesswork.

Question 40

It appears that the increase in concentration of pesticide in the tissues of successive organisms as it passes along a food chain is a fact with which many candidates were not comfortable. This led to wholesale guesswork, with all options being popular. A possibility is that the question was not carefully read, and candidates overlooked the fact that the answer needed them to identify the herbivore, not the carnivore at the end of the chain.

BIOLOGY (US)

Paper 0438/21
Core Theory

Key Messages

- Candidates should be made aware of the need to read each question thoroughly and to take note of the demands of each section before beginning their response.
- It should be noted that illegible work cannot be awarded credit.

General Comments

There were very few cases where candidates failed to attempt a whole question and little evidence that candidates had insufficient time to complete the paper. There were candidates who showed very limited knowledge and understanding of some topics from the syllabus. There was virtually no evidence that there were candidates who did not find the paper demanding in at least some of its aspects. There was evidence in a number of places, indicated in the comments on specific questions, that responses, though on the topic were inadequate or irrelevant. Candidates had difficulty in explaining phenomena and interpretation skills were lacking. Reading the instruction carefully is vital if the response is to fit the question. In a significant number of cases candidates' handwriting was very hard to interpret. Mistakes should be clearly crossed out and written again not over-written and very small writing also presents problems when the spelling of a term is crucial to the biology. In some cases responses were too vague to gain credit and in a few the candidates' poor language skills made it very difficult to work out what they were trying to convey.

Comments on specific questions

Question 1

Most candidates were able to identify at least one other group of arthropods, although a surprising number thought molluscs belonged to this group. Usually the feature given as specific to the group chosen was the number of legs, although wings were accepted for insects. The presence of an exoskeleton is a feature of all the groups of arthropods as is having jointed legs and thus neither feature could gain credit. Most candidates used the information in the question in part **(b)** but many had difficulty in expressing their ideas clearly enough to gain both marks in each case.

Question 2

Few gained maximum credit in this question. Many candidates did not appreciate that differences were required in each case and just made statements involving no comparisons. The use of a comparative term, such as 'more' or 'less' was considered adequate. Numerical values were not required, neither were candidates required to give reasons for the differences, which some attempted to do.

Question 3

Most candidates recognised the components of the blood indicated and realised what they had to do to complete this section of the question. Some suggested structural features such as the presence of haemoglobin in the red blood cell, rather than a function for the cell, such as the transport of oxygen. A number of candidates thought that plasma formed antibodies rather than transporting them. In **(b)** some identified the missing component as platelets but knowledge and understanding of their role was poor.

Question 4

The majority of candidates completed the bar graph successfully but many either found the calculation in **(a) (ii)** too difficult, or did not understand what to do. Prostate cancer was usually identified correctly as occurring only in males although a number failed to read the question with sufficient care and suggested

breast cancer for this response. In **(b)(i)** responses were sometimes too vague to gain credit. Knowledge of ways of reducing the risks of suffering from coronary heart disease was good, with many gaining credit here, Some spoilt their responses by giving general responses such as 'avoid junk foods', without explaining what they meant or with incomplete instructions such as 'don't drink'. In **(b)(ii)** references to alcohol needed to be qualified, such as 'drinking excessive alcohol' or 'addiction to alcohol'.

Question 5

In this question **(a)(i)** was meant to test the candidates ability to observe and compare two specimens, and most candidates completed this successfully. Many candidates identified the farming practice as selective breeding in **(a)(ii)** and candidates should have not offered responses such as 'genetic engineering' as they should have been aware that this is a recent development and has not been in use for hundreds of years. The candidates' knowledge of wind-pollinated flowers should have enabled them to complete **(b)** but a number made comments on flower colour or lack of scent, for which they had no evidence. It was expected that they would comment on the feathery stigmas and the anthers hanging out of the floral parts. In **(c)**, those candidates who correctly identified the chemical reaction usually also named the gases correctly, but a significant number thought anaerobic respiration was involved and then suggested that carbon dioxide was used up and oxygen produced. There was also a significant number of candidates who suggested that the reaction was photosynthesis and then commented in **(c)(iv)** about a lack of light. If candidates had noted the information about the temperature within the pit they should have realised that enzymes in the seeds would become denatured, thus killing living organisms, and so respiration would cease. They should have used this, together with deductions about changes in the gases in the pit, to respond to **(c)(iv)**. Part **(c)** was poorly answered overall, suggesting that some candidates cannot apply their knowledge and understanding in unfamiliar situations.

Question 6

Most candidates gained some credit in this question but relatively few gained maximum marks. Most knew that alleles were alternative forms of genes but a number thought that single sets of unpaired chromosomes were found in muscles. Many gained at least half of the marks available in this question.

Question 7

Most candidates managed to identify one of the arrows representing respiration but combustion was often confused with production of fossil fuels and photosynthesis, represented by C, was often misidentified. In **(a)(ii)**, references to global warming were often made but few were able to explain why this was a problem. In **(b)(i)**, most listed the four organisms in the correct order but the direction of the arrows representing the energy flow frequently suggested that it flowed away from the top carnivore, the oxpecker bird, to the grass. Candidates should be familiar with the convention used in food chains and food webs. Many candidates were unable to explain in scientific terms the difference between a chain and a cycle but many clearly realised that carbon dioxide produced in respiration was re-used, but energy, lost from a food chain, was of no further use to the living components of an ecosystem.

Question 8

A very large number of candidates appeared unaware of the mechanism for the inheritance of sex in humans Some allocated only one chromosome to each type of individual, and almost half of the candidates thought that a female inherited at least one Y chromosome. Many were also unable to complete the diagram accurately. Some allocated two chromosomes to each gamete, while others attempted to complete Punnet squares, in spite of the diagram provided, and their responses became very confused. This question was poorly answered and indicated little knowledge or understanding of this topic.

Question 9

In **(a)** most candidates revealed knowledge of the protein nature of enzymes, and also of their roles as catalysts. In **(b)** only about half choose the correct reagent, Benedict's solution, to show the presence of reducing sugars but many failed to warm the mixture or to give details of the colour change expected if the result was positive. This suggested they were unfamiliar with the practical test involved. In **(c)** most read the graph correctly but then failed to interpret it to describe how the changes in pH affected the activity of this enzyme. A significant number just expanded on the term optimum pH, rather than explaining how activity rose with increasing pH up to the optimum and then fell at higher pH levels as the enzyme became denatured. In **(d)** there was evidence of careless reading of the question as many described the action of saliva and others described swallowing but few described the role of teeth in breaking up large lumps of food

into smaller particles to increase surface area for enzyme activity. Many candidates confused the action of the teeth with the molecular changes brought about by enzymes.

Question 10

Most candidates gained credit in both sections of **(a)**, although a small number tried to put glucose or sugar on both sides of the equation. In **(b)**, knowledge of water uptake was often confused with transpiration. Few mentioned root hairs as the point of entry of water or osmosis as the mechanism involved. There were many who tried to describe the movement of the water after it had entered a plant and this indicated careless reading of the question. Basic biological knowledge appeared weak.

BIOLOGY (US)

Paper 0438/31
Extended Theory

Key Messages

- Almost every question in this paper includes stimulus material, such as graphs, tables, photographs, diagrams, drawings or prose, much of which was unfamiliar to candidates. Those who gained most credit from data interpretation questions often annotated the tables or graphs provided as they read through the information. Annotating graphs and tables is a key examination technique in science and one that candidates should practise.

- Candidates should be able to give precise answers to data response questions and use correct scientific terminology. Words such as increase, decrease, peak, maximum, minimum, and optimum should be used to describe trends and patterns. Some candidates showed that they had a good command of this vocabulary. Vague terms rarely gain credit and hence words such as 'affect', 'effect' and 'change' should be avoided; for example, an answer that states that 'the rate of breathing changes' is unlikely to gain any credit.

- Data from tables and graphs should always be given with the appropriate units.

- Candidates should pay careful attention to the specific number of responses requested in a list. This rule also applies to questions where one answer is required.

- Incorrect answers must be crossed out and the correct answer written alongside or just above the first answer. Where an answer is a single letter or number, it is particularly important that candidates do not write on top of an original answer. Where the answer is illegible no credit can be awarded.

- Answers to questions that are continued in blank spaces or on additional paper must be identified clearly with the appropriate number and letter, e.g. **2(c)(i)**. Additionally, candidates should make reference to the continuation answers in the answer spaces provided for each question.

- Candidates should avoid writing initial answers in pencil and then overwriting in pen and should also not use thick felt tip pens as the ink run through can affect the clarity of the answer overleaf.

General Comments

Candidates are encouraged to attempt every question and to take note of the mark allocation as a guide to how many points are expected. Writing should be clear. Candidates should try to leave time to read through their answers and amend or add to them as necessary.

Comments on specific questions

Question 1

(a) Most candidates completed the table in the way intended with ticks and crosses. Only a few candidates left gaps in their answers. Most answered correctly, but a common error was to indicate that mammals have feathers.

(b) Cassowaries feed on fruits, but often the seeds are not digested. In answer to this question, it was expected that candidates would state that fruits are soft or seeds are hard, and that cassowaries do not have the enzymes to digest seeds or their testas. A common misconception was that the seeds are too big for the birds to swallow. Some candidates thought that the reason for not digesting seeds was that they had to be distributed undamaged.

(c) Most candidates chose wind as a method of seed dispersal, but went on to describe adaptations for wind *pollination*. Few candidates explained how seeds are dispersed in the wind by reference to their adaptations for this method. Candidates who wrote about self-dispersal rarely named the method, but instead just gave a detail of a particular mechanism.

(d) Most candidates correctly identified three conditions required for germination. Most gave water, warmth and oxygen, but light and other methods of breaking dormancy were accepted as they are considered conditions for germination. However, 'hot' was not credited as an alternative to warmth and 'humidity' was not accepted as an alternative to water or moisture.

(e) The first expected answer was that cassowaries need a large area in which to live; the reverse argument was not accepted as it forms part of the question. Very few candidates went on to use the information from the beginning of the question that these birds are flightless and so cannot move easily from one small reserve area to another, nor did they mention the need for many trees to produce enough fruit, or the limited availability of nesting sites in small reserves.

Question 2

(a) (i) Most candidates stated correctly that a balanced diet must provide the appropriate nutrients in the right quantities. Very few went on to write about the provision of sufficient energy or materials for metabolism. Candidates should not attempt to define a term by using that term in their answer, for example by using the word 'balanced' to describe a balanced diet.

(ii) Most candidates gained full credit. 'Height' was not accepted, nor was just 'health' as an alternative to disease or a stated medical condition.

(b) (i) Most candidates drew the line indicating the renal threshold along the correct gridline on Fig. 2.1. It is good practice to add labels to lines drawn onto graphs; for example, some candidates put a **(i)** next to their line. Although in this case there was rarely any confusion with the answer to **(b)(iii)**, candidates should always be encouraged to do this if there are two or more lines on one set of axes.

(ii) The time period when glucose appeared in the urine was from 60 to 300 minutes or from one hour to five hours. 240 minutes and four hours were credited. Many candidates gave a particular time, such as 60 minutes, 150 minutes or 300 minutes rather than a period of time.

(iii) Many candidates gave no response. The dome-shaped line should have gone right across the graph. No credit was awarded for lines that stopped short of 330 minutes. Again, it was helpful if the line was labelled **(iii)**. Lines were mostly drawn, correctly, beneath the 180 line, but some were flat and gained no credit.

(c) Many candidates obtained full credit for their answers explaining how people who do not have diabetes control their blood glucose concentration. Some candidates mentioned insulin, but did not state that it is secreted, produced or released by the pancreas. Very few candidates stated that glucose is absorbed by cells in the liver or muscles. There were some references to the kidney excreting excess glucose as is the case for the diabetic in this question. Some candidates confused insulin with glucagon.

Question 3

(a) (i) Many candidates identified enzyme **1** in the flow chart in Fig. 3.1 as amylase. Among the incorrect answers were 'carbohydrates'. Carbohydrase was not accepted as that is too general a term.

(ii) In this question, some candidates wrote about the enzyme being 'killed' rather than denatured by an extreme pH, although less frequently than in some previous examinations. There were some vague answers that did not merit any credit. Use of the term *optimum* was the most common way to gain credit here.

(b) Few candidates used the information from the diagram to work out that protease could break down enzyme **2** if the pH was not adjusted to make the protease inactive. Most gave vague references to protease contaminating the process.

(c) The suggestion that the enzyme can tolerate hot temperatures was not credited. The Examiners were looking for the idea that the enzyme is stable at high temperatures.

(d) The question was about the production of enzymes for use in washing powders. Many candidates wrote about how the enzymes in washing powders digest fat and protein stains on clothing. No credit was given to these answers. The Examiners were looking for details of the fermentation process and any information on the role of bacteria in producing the enzymes. Some bacteria secrete the enzymes so that they can be easily harvested from the fermenter; others do not secrete them and therefore the bacteria have to be crushed to extract the enzymes.

(e) Most candidates only gained partial credit, with many simply stating that pectinase would increase the quantity of juice produced. Better answers stated that the juice is clearer and sweeter as pectins are broken down to sugars. Very few candidates wrote of the pectin being digested. A common error was to state that extraction of the juice was 'easier' without explaining how this is achieved.

Question 4

(a) Some candidates described the effects of sickle cell anaemia in absolute terms rather than in relative terms. They stated that no oxygen or carbon dioxide would be transported in the blood, rather than stating that there would be less oxygen or carbon dioxide carried. Candidates wrote about blood vessels being blocked by the red blood cells, but did not gain credit unless they stated that these blocked vessels are capillaries.

(b) (i) Many stated that the name for the alternative forms of a gene is *allele*.

(ii) When completing the genetic diagram, some candidates forgot that gametes are haploid and put two alleles in each of the circles provided. However, the Examiners ignored whatever error had occurred in adding the gametes when marking the child's genotype. As many candidates gave the correct genotype, H^SH^S, it was surprising that some did not use some back-reasoning to make their gametes haploid, rather than diploid.

(iii) Many gave the correct probability (0.25 or 25%). Where ratios (3:1) were given as well, they were ignored, so candidates gained the credit for the correct probability.

(c) (i) Few candidates gave satisfactory answers to this question. Successful explanations were structured around the three genotypes, H^AH^A, H^SH^S and H^AH^S. The key point is that people who are heterozygous, H^AH^S, have a resistance to malaria. Other points develop from this. In many cases, candidates thought that sickle cell anaemia is an infection that can be passed from person to person and did not make the link with malaria at all. Candidates should be aware that the H^S allele confers resistance to malaria, not immunity.

(ii) Very few satisfactory answers were given. Many referred to the quality of health services in the areas compared to other malaria-infested areas. The Examiners accepted any sensible suggestions, such as the idea that malaria may have only recently spread to these areas and that strains of malaria that do exist are not as severe as those elsewhere. Another line of argument is that the mutation has not occurred in people who live in these areas, or that in the distant past people who migrated to Indonesia and northern Australia did not have the mutation. The frequency of the allele, H^S, is very low in Indonesia. It is thought that it was introduced into the population in colonial times by troops from West Africa.

Question 5

(a) Many candidates completed the table correctly, but some ignored the column heading for sense organ, thus losing all the credit available. The mouth does not count as a sense organ, and 'heat' was not accepted for temperature. 'Sight' was sometimes given instead of light as a stimulus.

(b) (i) In explaining the term *involuntary action*, most candidates wrote about not having to think, use the brain or make decisions, but few stated that it is a response to a stimulus.

(ii) Care with structuring the answer was the key to success in this question. Candidates who followed the sequence of structures in Fig. 5.1 tended to gain credit by beginning with the receptor and ending with contraction of the biceps to give the response. Many candidates referred incorrectly to

'messages' and 'signals' instead of electrical or nerve impulses. Candidates often did not make any distinction between the receptor and the sensory neurone. Even if the receptor is simply the nerve ending, the term *receptor* should still be used in the answer.

(iii) Many candidates gained full credit for describing the advantages of simple reflexes.

(c) Most candidates mentioned hormones in their answers, but some did not expand upon this to state that they travel in the blood or stimulate target organs.

Question 6

(a) Parts **(i)**, **(ii)** and **(iii)** were answered correctly by many candidates. Many chose proteins or amino acids for their nitrogen-containing compound. Part **(iv)** was more challenging as few identified process **F** as nitrification or oxidation.

(b) Most candidates gained credit for using their answer to part **(a)(i)** to state that nitrogen is required to make important molecules, such as amino acids and proteins. Some went further to state that these molecules are required for growth and repair. A few candidates stated that atmospheric nitrogen is in short supply, when what they meant is that fixed nitrogen in all its forms is in short supply.

(c) Most candidates explained the rarity of *Cassia mimosoides* in terms of it growing in an unsuitable habitat with unfavourable growing conditions. They stated that the climate is too dry and the soil provides few minerals. A few candidates spotted that there is an arrow between *C. mimosoides* and impala indicating that impala prefer to eat it. Similarly, there were few who used the information provided to suggest that *C. mimosoides* does not compete well with grasses.

(d) Most candidates obtained some credit for explaining why there are far fewer cheetah than impala. The reference to the numbers should have prompted answers that dealt with energy flow in food chains, but few explored this central idea in ecology. Full explanations were rare, although some candidates stated that local people might kill cheetahs to protect their livestock, or that not all the impalas would be eaten.

(e) Most candidates gained partial credit for explaining that all the organisms in an ecosystem are interdependent. This point was made in a variety of ways, some by stating that the loss of one species may lead to the extinction of another. The other points about the dependence on plants, eating a variety of foods, conservation of habitat, maintaining biodiversity and conserving natural ecosystems for future generations were seen rarely. These are important concepts. Some candidates simply repeated the information in the question.

BIOLOGY

Paper 0438/51

Practical Test

Key Messages

Candidates should be familiar with practical procedures outlined in the syllabus.

It is important that candidates use a good HB pencil and eraser for drawings and graph construction.

Drawings should have a clear continuous outline and be labelled. The guide line for a label must make contact with the structure intended without a gap or an arrow head.

Food tests need to record the starting colour when noting the changes if certain food types are present.

General comments

Most candidates were prepared to answer the questions and these were generally answered in accordance with the instructions given.

Plotting graphs need to be scaled so the plots fit and use most of the available grid with plots covering more than half in both dimensions. The correct choice of graph to represent the data accurately is important and in this paper candidates were required to present the data as a bar chart using discrete columns of equal width labelled clearly on the axis.

Comments on specific questions

Question 1

(a) Most candidates successfully identified differences in the shapes of the three types of seeds but were less accurate when describing the appearance. The most common error was to choose a feature that was the same for all the seeds, e.g. shiny.

(b) (i) Most candidates were familiar with the use of biuret to show that lentil seeds contain protein. It is important to describe the colour change and although many candidates knew that it would become purple, they did not refer to the original colour. A small number of candidates incorrectly heated the biuret with the seed.

(ii) Many candidates were familiar with the use of ethanol to show that lentil seeds contain fat. Candidates were given independent credit for the additions of alcohol and water and the appearance of the emulsion or cloudy/white result. The most common error was to omit the water. Only the better candidates gained full credit.

A few candidates gained partial credit for a correct description of the grease spot test and there were a small number of incorrect diet related answers.

(c) Many candidates did not get the expected results and this is because they did not leave the seeds for long enough.

(d) (i) Overall, the bar charts were well constructed and well presented. Vertical or horizontal bars were accepted.

The labels for the axes should be taken directly from the headings on the table of results. The majority of candidates only used ‘percentage’ but credit was given.

Most candidates chose an appropriate scale, using more than half of the available grid for their plots, and axes were labelled correctly. A small number of weaker candidates incorrectly took the percentage values from the table and placed them equally along the axis. A common error was that candidates did not use the same axes for their plots. These candidates lost credit for their axes but were given credit for their plots. Some candidates constructed two bar charts, either side by side or one above the other. They were given credit when they used the same axes for both. A small number of weaker candidates incorrectly tried to plot the percentage protein and fat values against each other without having an axis for the seeds.

Most candidates plotted their bars correctly and few errors were seen. Some candidates chose to plot the fat and protein percentage values side by side, and others chose to use one bar but represent both values within it. Both were acceptable.

The bars for the different seeds should be separate but a common error was to draw all the bars touching. Those candidates who plotted the fat and protein values side by side for each seed were given credit if these bars touched, as long as there were spaces between the different seeds. A small number of candidates did not draw bars of equal width.

Most candidates used appropriate labels or a key to distinguish between the values for the protein and fat. Many variations were accepted.

(ii) Most candidates correctly chose the soya bean seed.

(e) The better candidates recognised the need to measure the change in temperature of the water, or at least the initial and final temperatures of the water. The most common errors were to say that the temperature would be measured throughout the experiment or only at the end of the experiment. Some candidates did not understand the experiment and incorrectly stated that the temperature reached was equivalent to the energy released.

Only the better candidates correctly identified what had to be controlled. A number of candidates were confused between 'to measure' and 'to control' and some of them incorrectly said that they would need to control the temperature. A common error was to suggest setting up a control such as having the same experiment with dead soya beans.

Many candidates correctly identified a safety measure but some candidates' answers only listed safety measures.

Quite a number of weaker candidates designed completely different experiments. One other common error was to ignore any experimental procedure and use the mass of the soya beans to calculate the energy content of the beans using the information from the label given in Fig. 1.1.

Question 2

(a) This was completed by many candidates.

(b) The difference between the cucumber immediately on immersion and 10 minutes after immersion was not obvious in the diagrams of most candidates, which suggests that the instructions were not followed carefully enough. The slice of cucumber should have been a maximum of 2 mm thick. If this was exceeded, then there would be no change after 10 minutes.

(c) Overall, this was not answered well. The observation that both tissues had not changed meant that they could not explain why. There were a number of more able candidates who did get different results, understood the process and explained it well. A common error was to say that solution **E** was moving in and out of cells rather than water. A number of candidates only described the effects instead of explaining the results. Explanations of the concentration gradients were poorly described.

(d) This was not answered well and only a small number of more able candidates gained full credit here.

Some candidates identified temperature or timing as a source of error, but did not identify the error as the fact that they were different for each piece of cucumber. They were given credit for an

improvement to keep them both the same. A small number of candidates did identify the need for repeating the procedure. The most common errors were different volumes of solution and water, inaccurate timing or inaccurate measurements of the thickness of the slice. A small number of candidates incorrectly stated that there should have been a control experiment.

Question 3

(a) (i) This question was poorly answered. The majority of candidates did not know that molluscs have tentacles and many answers used the incorrect terms, antennae, anthers or antlers. Common errors were the presence of eyes and that both animals were slimy or soft, but neither of these were visible in Fig. 3.1. 'Unsegmented' was quite well known but only better candidates knew about the muscular foot.

(ii) Most candidates successfully identified the shell as a visible difference between the slug and the snail.

(b) (i) Overall the shells were drawn well and the lines used were single, continuous and clear. The most common error was to include shading; there should be no shading in a biological drawing. Most drawings were drawn larger than the specimen and accurately represented details of the shell. Some drawings did not give enough detail of the opening or the surface of the shell.

(ii) The majority of candidates only stated protection or hiding, but the better candidates did qualify their answer in terms of protection against predators or a named environmental factor. A small number correctly referred to the shell preventing the snail drying out.