

# BIOLOGY

**Paper 0610/01**  
**Multiple Choice**

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

## General comments

The mean mark for this paper was on the high side compared with previous years, with very close to at least half the candidates being able successfully to answer all the questions.

## Comments on individual questions:

### **Question 9**

There may have been a misunderstanding relating to the tense used in the wording of the question with candidates believing that they were being asked 'In which tube *have* molecules moved from **X** to **Y**' since over a third opted for **B**. Even so, there could not have been such a high concentration as that shown at **Y**.

**Question 18**

The two different forms of anaerobic respiration specified in the syllabus would appear to be far from clear in the minds of many candidates. The belief that carbon dioxide is released during anaerobic respiration in muscles exists amongst some otherwise sound performers.

**Question 25**

Statistically, this question did not meet the required standard for the paper. In the minds of most candidates, it came down to a straight choice between **A** and **C**, with option **D** failing to attract anyone. A possible explanation for so many candidates opting for **C**, is the possession of an inaccurate belief that a negative response is not really a response at all.

**Question 32**

This question demanded an ability to understand quite a detailed definition. That a very high percentage (96%) were able to do so was impressive, even though it rendered the question rather too easy to be a valid instrument of discrimination.

**Question 36**

With both a diagram and a table to understand, this question may have appeared somewhat daunting to some candidates. A very high percentage (again 96%) were able to appreciate that the information required to reach the correct answer was simply that photosynthesis occurs during the day.

**Question 37**

Again, the candidates found this a very easy question. There was a hint, however, that some of the better candidates may have looked for a hidden catch.

**Question 38**

This proved to be a third easy question in a row, made so, to some degree, by the fact that no candidate was able to accept that deforestation would lead to more species.

**Question 40**

This question performed well in that 73% opted for the correct answer, but there was a suspicion that a very few of the better candidates may have felt that, to compensate for a loss of chlorophyll, plants might produce larger leaves. Even if this were a short-term response, to lose its chlorophyll 'over a long period of time' could not plausibly result in anything but an inability to survive.

# BIOLOGY

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**Paper 0610/02**

**Paper 2 (Core)**

## **General comments**

The vast majority of candidates attempted all parts of all questions. When this did not occur it appeared to be linked to candidates who seemed inadequately prepared for the demands of the paper rather than not having sufficient time to respond to the questions. There were some candidates who showed very limited knowledge and understanding of some topics from the syllabus and most found the paper demanding in at least some of its aspects. Responses to various sections of questions revealed again this year certain misconceptions and misunderstandings that have been reported in previous reports. The handling of questions in which candidates were asked to make predictions were, overall, answered more strongly and logically than in many previous examinations. However there was evidence in a number of places that candidates had not read the questions carefully or thoroughly enough and thus, their responses were inadequate or off the point. Candidates should be made aware that, in questions that demand differences or comparisons, responses should include both aspects of a difference. Similarly, if a response table is given, the statements on the same response line should be related.

## **Comments on specific questions**

### **Question 1**

This question presented few difficulties to the majority of candidates. A number of candidates linked mammal with “body with naked skin” rather than selecting “body with hair”. This was not restricted to those gaining low scores overall and suggests careless or inadequate reading of the descriptions. A few candidates linked a class of vertebrate to two descriptions and in these circumstances no credit was given even if one of the links was correct.

### **Question 2**

This question was poorly answered overall. There was clearly confusion between sewage and refuse. There were also a significant number of candidates who seemed to think that the term sewage referred to all forms of pollution.

- (a)** Responses were characterised either by the muddling of refuse with sewage as candidates listed items such as plastic as part of sewage or by vague responses that simply referred to pollutants or rubbish. There were a few who showed some understanding of the subject matter but confused sewage with the sewerage system and described a network of pipes carrying materials to the treatment works. Few linked the term to urine, faeces and other water waste from homes or industry. There were a significant number who linked sewage to fertiliser waste. This may have been as an afterthought following their responses in (b).
- (b)** Although untreated sewage can cause similar effects in rivers to excess fertilisers the latter should not have been the key point of the response. Few seemed to realise that there was an increased risk of the transmission of waterborne diseases such as cholera. Despite the weaknesses of many responses, often characterised by vague responses such as “living organisms die”, a significant proportion of candidates gained full credit.

**Question 3**

There was some evidence both from (a)(ii) and (c) that there are a number of candidates who do not understand the convention of the arrows in a food chain or food web. Their responses suggest that they believe the arrow points to the source of food rather than the consumer.

- (a)(i) The majority of candidates were able to identify both the producer and a primary consumer but far fewer correctly identified a tertiary consumer and instead named an animal from the third trophic level.
- (ii) The food chain was correctly completed in the vast majority of responses. There were a few who failed to start from a producer and some who created non-existent food chains from the organisms shown in the web. There were a few inevitably who ignored the instruction to use information from Fig. 3.1 and produced food chains involving other organisms entirely.
- (b) The pyramid of numbers had 6 trophic levels and thus could relate to only one food chain within the web, grass via the impala to the hawk. Thus the only valid response was the tick. The majority named an organism from the third level of the other food chains, even the leopard and hawk that were the final member of certain food chains, although the pyramid showed three levels of consumers above the labelled box. The comparative width of the labelled box should also have provided a clue that this level had a larger number of individuals than the level below it and thus they would have to have been smaller in terms of biomass.
- (c) On the whole predictions with the accompanying explanation were logical and well explained. Although the phrase "plague of locusts" was intended to indicate a very large numbers of this insect there were a significant proportion of candidates who interpreted this as a disease of locusts. In both cases credit was given for logical, clear developments that related to the candidate's interpretation. Although most candidates based their prediction on the effect of locust, on scorpion and then on baboon numbers a significant number considered the effect of the locusts on the grass, impala, leopard and thence the baboon numbers. All approaches were considered equally worthy of credit.

**Question 4**

- (a)(i) There were a number of candidates who did not enter any values in the two empty boxes in Table 4.2 as well as an even greater number who miscounted the numbers of relevant individuals. One example of good practice was seen in a number of scripts where the candidate had ticked each relevant individual, in the two missing sets of data, in Table 4.1. This would allow rapid checking of the data.
- (ii) It was quite apparent that very many candidates did not read the instruction carefully or were not aware of the difference between a histogram and a line graph since about many plotted the latter. Also they should be aware that the scale for the mass of berry should be entered below each bar of the histogram and not in the intervals between them. There were candidates who plotted values for 0.1 and 0.2 g although there was no data given for either of these as no berries this small were found in the survey.
- (b) Candidates seemed unfamiliar with the type of variation shown by the range of 0.3 to 0.7 g, namely continuous variation, as this response occurred quite rarely. More frequently the response was discontinuous variation which may have occurred because of confusion between the two terms or because candidates ignored the instruction and looked at the whole range of mass. However many candidates failed to name any type of variation but tried to explain why variation occurs. This was a question section that was left blank by a significant number of candidates.

### Question 5

- (a) The labelling of the diagram was normally clear with lines going to precise parts but knowledge of flower structure was weak. Large numbers of candidates thought that the ovaries were the stamens and there was also confusion between the stigma/style and both sepals and stamens.
- (b) The main weakness was that candidates did not produce differences. Each row should illustrate a clear difference between the two methods of pollination adaptations. Thus to state that insect pollinated flowers have a nectary and in the same row of the table to state that wind pollinated flowers had light pollen is inadequate. Although there were few biologically erroneous answers, there were large numbers of vague ones, such as insect pollinated flowers are tall and wind pollinated plants are short. This also illustrates the use of flower and plant as if they are synonymous. There were a few candidates who repeated the example given in the table
- (c) In general the site of pollination was better known than the site of fertilisation although there were candidates who quoted the source of pollen rather than its destination in response to (i). Candidates should be made aware that the term ovum is not normally used in reference to plants.
- (d) The majority of candidates recognised the competition aspect in area **B** but so often failed to make it clear that it was competition between seedlings and the mature tree rather than between individual seedlings which would occur in area **A** as well. Often candidates did not develop the competition theme to relate it to environmental factors such as light, water or minerals.

### Question 6

- (a) A large proportion of the candidates were able to identify the three types of teeth labelled in the diagram, as well as describing the function of two of them. The main errors were that **X** was often named as a premolar or wisdom tooth and the naming of **X** and **Z** was reversed. Occasionally the functions of **X** and **Z** were also reversed although the teeth had been correctly identified in (i).
- (b) There was evidence of confusion between minerals and vitamins with a few candidates naming a vitamin in both response spaces or completely reversing the responses. Iron was an erroneous popular choice for the mineral, as it has been in previous occasions in relation to bone. The question was about the healthy development of teeth rather than their maintenance in later life and thus references to scurvy were not relevant.
- (c)(i) Few candidates seemed to have an understanding of the role of bacteria in tooth decay. Many responses implied and some even stated that bacteria were formed from sugar or other food remains in the mouth. Many stated that it was the sugars that destroyed the enamel. Candidates should understand that bacteria present use sugars and form an acid that erodes the enamel allowing bacteria access to the dentine and pulp cavity.
- (ii) The care of teeth was well known and full credit was awarded to the majority of candidates.

### Question 7

- (a) So many candidates did not appear to have taken note of the reference to structural differences in the question and gave other differences such as the pulse, pressure and oxygen state of the blood in the two types of blood vessel. Additionally there were responses that muddled features of capillaries with both veins and arteries. Many responses only gave part of a difference with responses such as veins have valves
- (b) Some candidates in (i) named veins in their responses although the question referred to an artery. There were also a variety of wrong arteries named. In (ii) a greater number named the liver and the kidneys than other combinations but among these there were a significant number who reversed the roles of these organs. Unfortunately many named parts of the alimentary canal featured among the wrong organs listed.
- (c) The correct value, 2, was commonly given for the number of times blood passes through the heart in one complete circuit of the body. Candidates seemed very familiar with actions that can be taken to maintain a healthy heart with reduced fat intake, not smoking, taking regular exercise and avoiding excess alcohol or stress being very common responses. Responses such as "not drinking" were considered inadequate.

### Question 8

- (a)(i) A small proportion of candidates seemed to realise that light absorption was a function of chloroplast. Candidates should be made aware that chloroplasts do not “attract” light.
- (ii) Very few candidates commented on the greater proportion of chloroplasts being present in the palisade layer with some ascribing this to the epidermis. More candidates did recognise that the chloroplasts were closer to the surface that light normally enters the leaf through.
- (iii) A greater proportion understood the role of stomata and of the intercellular spaces of the spongy mesophyll layer in the provision of carbon dioxide for photosynthesis. However many unfortunately commented only on the relationship of these structures to transpiration. A popular misconception seemed to be that water for photosynthesis enters and leaves via the stomata.
- (b) The phloem was rarely named as the relevant tissue in (i) and most frequently amino acids were named as a mineral ion in response to (ii)

### Question 9

- (a)(i) Although the general details of diffusion were understood there were infrequent references to the movement of molecules or particles and just general comments about substances. Candidates should be aware that responses dealing with concentration gradients should refer to movement down such a gradient rather than across or along. Also for diffusion to occur there is no requirement for any membrane, either partially or completely permeable.
- (ii) Candidates were expected to comment on the difference in concentration between the alveolar air and the blood.
- (iii) Many of the responses did not identify features of gaseous exchange surfaces, such as thinness of wall, closeness to blood vessels, enlarged surface area or being moist. Instead a majority of candidates named various exchange surfaces or organs such as gills, lungs and structures like the trachea and bronchi. Other erroneous responses dealt with structures and processes related to breathing.
- (b)(i) A pleasing number of responses recognised the concentration difference between the alveolar air and the blood being smaller at high altitude and thus the uptake being slower and less overall.
- (ii) Again an encouraging number of candidates recognised the value of enhancing the red blood cell numbers in the athletes' blood and correctly predicted greater potential carriage of oxygen and improved performance. However there were a number who thought that athletes carried out this action because it would impair their performance despite the clue that it was considered to be cheating. There were a small but significant number who tried to link the extra red blood cells to improving immunity.

# BIOLOGY

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<p><b>Paper 0610/03</b></p> <p><b>Paper 3 (Extended)</b></p>
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## General comments

Students performed particularly well on this paper, with some gaining near maximum marks. The paper continued to discriminate well, with questions proving to be challenging but accessible: there were parts of all questions which even the weakest candidates could answer and very few questions were left blank. The most difficult areas proved to be details of the roles of soil bacteria, **Question 4(b)(ii)** and limiting factors in **Question 5(b)(ii)**. It was surprising that many candidates struggled to give accurate details of tooth structure in **Question 2(a)**. Again, there was little evidence of candidates running out of time. Many more Centres are now teaching about genetic engineering, reflected in high scores for **Question 5(c)**.

The accuracy of spellings was greater than in previous sessions. Handwriting and general presentation were less good, but the meaning of answers was clear in all but a very few cases.

## Comments on specific questions

### Question 1

Most candidates were able to attempt both sections of this question, with the majority gaining near maximum marks.

- (a) The key was used correctly by nearly all candidates to derive the names of the mammals shown.
- (b) This was also answered well, but some candidates stated features that were not visible in Fig. 1.2.

### Question 2

This was less well answered, with part (a) surprisingly being the lowest scoring question on the paper.

- (a)(i) The root was sometimes identified as enamel or dentine instead of the name of the part.
- (ii) Naming the tooth as a premolar was the commonest error. Few candidates were able to refer to the cusps (or describe them accurately) or to the number of roots present.
- (iii) This proved to be a difficult question. Little knowledge of the difference in structure between root and crown was displayed. Many suggested that there was less enamel on the root, rather than the root being covered only in dentine (or cement), which is softer and therefore less resistant to acid than the crown.
- (b) Two marks were available for identifying features of the toothpaste that would help to protect teeth from decay. Candidates then needed to explain the role these features in preventing decay. There were often vague or biologically incorrect answers about the function of fluoride (hardening teeth rather than hardening enamel, whitening teeth, killing bacteria or neutralising acid) and candidates needed to explain in more detail why killing bacteria reduces tooth decay, linking them with the production of acid that attacks enamel.
- (c) The majority of candidates had no difficulty stating two other ways of maintaining healthy teeth, with most relating tooth care with diet, not abusing teeth by cracking nuts or opening bottles and regular dental inspection and using dental floss. Some gave examples already used in the question.

### Question 3

Candidates tended to answer the question well, with the last part being the most challenging.

- (a)(i)** Deforestation was well known.
- (ii)** Most completed this with little difficulty. Some gave other examples of agricultural uses such as the production of soya and beef, or gave two very similar uses.
- (iii)** The majority of candidates gave good accounts of the likely effects of clearing forests, gaining maximum or near maximum marks. Some gave benefits of clearance, already covered in previous parts of the question, or made inappropriate details about damage to the ozone layer or acid rain. Others went off at a tangent, listing everything they knew about the environmental consequences of global warming.
- (b)(i)** Most candidates correctly compared the fat and fibre contents of the two foods, but fewer were able to explain why the differences may have an effect on health. Few candidates appear to understand that foods high in energy are not necessarily healthy.
- (ii)** This proved to be a difficult concept to explain. Most knew that energy is lost along a food chain and had an idea of what happened to it. Weaker candidates wrote that corned beef provided less energy than soya sausage, based on data from the table rather than knowledge of energy flow through a food chain. Surprisingly few answers began by stating the two food chains involved. Where they were attempted, marks were sometimes lost because of references to cows being fed soya, or producers being referred to only as plants – rather than being named. Rarely were the food chains extended to humans.

### Question 4

High marks on this question were rare.

- (a)(i)** This was well answered by the majority of candidates, although one mark was often lost by the use of insufficiently accurate figures.
- (ii)** The idea of mutation was rarely included and few candidates gained more than two marks (usually for references to reproduction and an increase in numbers of the resistant population). The best answers included details of mutation, a new strain having resistance, reference to survival of the fittest or natural selection, reproduction and an increase in numbers of the resistant population.
- (b)(i)** Most candidates answered this correctly. Incorrect answers included bread, yeast and mushrooms.
- (ii)** Most candidates gained at least one mark for describing the role of bacteria in decomposing dead material. There was some confusion over nitrogen fixing bacteria and nitrifying bacteria. Some answers also included denitrifying bacteria, which have a detrimental effect on soil fertility. Some candidates knew about the role of nitrogen fixing bacteria, but referred to those in plant nodules - where they do not have a direct effect on soil fertility.
- (c)** This was answered very well, although a substantial minority confused where restriction endonuclease is used (stating stage 7 instead of 3 or 6).



### Question 5

As a whole this question was answered much better than plant based questions generally are.

- (a) Many otherwise well informed candidates did not know that guard cells contain chloroplasts, but the majority of answers had the types of cell in the correct order.
- (b)(i) This was usually correct. Weaker candidates gave words instead of symbols.
- (ii) Very few candidates could define the term *limiting* factor adequately. They usually missed out the point that it applies to situations where several factors can vary and alter the rate of a reaction. Varying the one in the shortest supply changes the rate of reaction even if all the other factors are at optimum levels.
- (iii) Approximately half of all candidates were able to identify carbon dioxide. Light was the most common incorrect answer.
- (c)(i) Most candidates gave reasonably good descriptions of xylem structure, although some described function rather than structure. There were frequent references to the presence of lignin without identifying where it is present.
- (ii) The functions of xylem were better known than those of phloem (where there were common references to the movement of un-named food, glucose and mineral salts).
- (d) This was well answered by most candidates, who understood that closing the stomata prevents excessive water loss from leaves.

### Question 6

The question was answered well by the substantial majority of candidates.

- (a) This was generally well answered although, in a significant number of cases, label lines were either not used or their more careful use would have been beneficial. Sometimes **E** was placed in the uterus muscle and **D** was too high or too low.
- (b)(i) Most candidates gained one mark for a reference to the passage of the ovum through the oviduct, but few referred to the role of ciliated cells or peristaltic muscles of the oviduct.
- (ii) Again, most candidates gained one mark for a reference to the presence of a tail for swimming, but fewer gained a second mark for a reference to mitochondria to provide energy or the streamlined nature of sperm cells. A number of candidates referred to the presence of enzymes to penetrate the ovum, but this did not answer the question.
- (iii) The haploid nature of the zygote was generally well known, but in many answers references to male and female gametes or sperm and eggs were omitted (instead talking about the mother's and father's cells).
- (iv) Many candidates were able to name *progesterone*, but few were aware that the placenta takes over its production.

# BIOLOGY

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**Paper 0610/04**

**Coursework**

## **General comments**

The coursework submitted for moderation this year included much work of a very high standard. There is no doubt that coursework helps candidates to develop the higher order skills of evaluation, looking critically at their work and determining the confidence with which they can view their results and conclusions.

Most Centres continue to use between 8 and 12 tasks. Almost all now set open-ended tasks, presented as worksheets or oral instructions that leave candidates to do quite a bit of thinking for themselves.

However, in a few cases this year, Centres were using inappropriate methods of assessment. There is immense value in encouraging candidates to work in groups, both when doing practical work and when doing written work, as the discussion and sharing of ideas has great benefits for candidates of all ability. However, this is *not* appropriate when assessing an individual candidate's performance. For example, when candidates are learning how to design an experiment, it is an excellent idea to use class discussion to decide on the procedures that will be used, and the way in which results will be collected. But when a candidate is being assessed on Skill C4, they must work alone, writing their own plan without discussion with others. That is the only way a candidate's individual performance can be assessed.

It is also important to consider the way in which the assessed work is presented to the Moderator. Centres are asked to provide *marked* work. The Moderators need to see the original work that a candidate has done, with the comments and marks given by the teacher written on this work, just as would normally be done for any piece of marked work. These comments are of great value to the candidate in helping them to see where they have done well and where they could do more in order to meet the criteria for a higher level performance. They also help the Moderator to understand why the teacher has decided on a particular mark. Unfortunately, a few Centres send in work that has clearly been rewritten, or word-processed, after being marked by the teacher. This work normally carries no comments from the teacher. This is not at all what is required. Moderators need to see the original work of the candidate, no matter how untidy this may be. Indeed, untidiness in some ways authenticates the originality of the coursework, showing that it has genuinely been produced within an experimental context, and not reworked at home after it has been marked.

# BIOLOGY

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**Paper 0610/05**

**Practical Test**

## General comments

Once again, a significant number of Centres did not submit Supervisor's Reports or a seating plan.

The Supervisor's Reports are an invaluable resource to examiners as they allow some alternative marking points to be credited in special circumstances, depending on the information given by the Centre. It could be the case that an experiment behaved in a way that was not anticipated or that candidates were supplied with a specimen that had features that were not expected and so had not been considered in the mark scheme. Under those circumstances, candidates can gain credit for what they could do and observe, even if the material had looked or behaved in an unexpected way. Centres not submitting reports with the scripts could find that their candidates are at a disadvantage. It should be noted that this report form is now found in the Confidential Instructions rather than the question paper itself.

If any difficulty is experienced in supplying suitable material or if there are any queries concerning how the material should be presented to the candidates, Centres should contact CIE for advice.

## Comments on specific questions

### **Question 1**

This question was testing the candidates' ability to follow instructions and to record observations. They were then required to carry out a procedure and, using the results obtained, they were asked to make a deduction.

- (a)(i) Most candidates had been supplied with suitable material. Some Centres supplied celery, which was not really suitable as the celery 'stalk' is in fact a petiole or leaf stalk, and therefore did not show the expected distribution of vascular bundles. However, if this material was identified in the Supervisor's Report, this was a case in which candidates could be credited for what they had observed. Some candidates cut the piece of stem longitudinally and lost some if not all of the marks, depending on the quality of their drawing and labelling. Only a few candidates presented drawings that were considered to be too small.
- (ii) Most candidates were able to measure the diameter of their drawing, although better candidates did indicate the limits of their measurement on the drawing itself. Most candidates could perform the basic calculation of the magnification, although Centres are reminded that 'times' or 'x' should be included in the answer and that the answer should be given to a maximum of 1 decimal place and be correctly rounded to that degree of accuracy.
- (b) The answers to this part of the question often failed to score full marks. The coloured dye in both stem sections was enclosed in the xylem of the vascular bundles. Consequently, candidates were expected to state that, for example, there were more areas or spots of dye in Fig. 1.1 than in W1. Answers such as 'the dye is spread out in all parts of the stem' were considered to be vague and gave the incorrect impression that the water was transported in the general stem tissue rather than in the vascular bundles.

- (c) This part of the question was not well answered. Candidates either did not state an external factor at all, or stated more than one, or referred to structural adaptations of the plant in reducing transpiration. Few mentioned that the stem or plant would need leaves attached to it. Candidates were expected to suggest the use of a potometer, coloured dye or a balance in conditions with and without the chosen factor and to state how the movement of water would be measured. A significant number of candidates dealt with this very briefly and instead concentrated on the expected results or gave detailed explanation of the method of movement of water through the plant. Neither of these was required.
- (d)(i) Most candidates were able to describe the appropriate test. Marks were allocated for the description of the procedure, so no credit was given for results or conclusions.
- (ii) A large number of candidates simply stated precautions that would ensure that the procedure would work rather than safety precautions. Some of the precautions given were vague such as 'be careful of hot water' without stating how.
- (iii) and (iv) Most candidates obtained the correct results and conclusions for the tests. A few seemed to have muddled the solutions, as the results were reversed. The most common error was to state that 'sugar' was present or absent rather than 'reducing sugar'.
- (v) About half of the candidates correctly deduced that sucrose was transported through the stem. The most common error was glucose, while some suggested starch, which had not featured in the question at all.

## Question 2

- (a)(i) A high proportion of candidates correctly identified the phylum as arthropoda. The most common error was to give the answer 'insect', as, presumably, the question had not been read thoroughly.
- (ii) If (i) had been answered correctly, then this part was frequently also correct.
- (b)(i) This was reasonably well known.
- (ii) Some candidates struggled to provide three characteristic features of insects, often being rather vague or imprecise, while some gave features of any invertebrate.
- (c) This was generally well answered, with most candidates clearly having had experience in using identification keys. The most common error was to incorrectly identify W5 and W7, although some candidates did provide the same answer for more than one animal. Some weaker candidates appeared to have little or no idea of how to use such a key. For these candidates, the answers or 'ideas' were written on the key itself, the animals identified by their common names or the question left blank.
- (d)(i) Most candidates made suitable observations concerning the reaction with dilute hydrochloric acid. It was surprising to note, however, the number of candidates who failed to describe any bubbling, effervescence or production of carbon dioxide with the mollusc shell even though this information had been given in the stem of the question in order to prompt them.
- (ii) This part was less well answered. Even those who had made good observations in (i) often made simple and vague statements about the ability of the outer covering of animals to withstand attack by acid or pollution. It was not unusual to see broad references that covered both animals, even though the outer coverings had behaved in different ways. It seems that some candidates, at least, did not realise that they were meant to use the information from testing the exoskeleton and shell to deduce that the mollusc shell was made of calcium carbonate while the fly exoskeleton was not. Credit was also given for correct reference to shell or exoskeleton, as candidates should have been able to use these terms. It was rare to award all 3 marks for this part of the question.

# BIOLOGY

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**Paper 0610/06**  
**Alternative to Practical**

## General comments

Candidates were able to attempt to answer all the questions and there seemed to be sufficient time for the paper to be completed in the hour allowed. This paper was comparable to the paper for last year (November 2005) in terms of difficulty. All parts to the questions were answered well by candidates, but points were spread out amongst different candidates. There were parts of some questions based on investigative and planning skills (C4), which some candidates found difficult and perhaps require further practise. There was evidence that some candidates had not experienced some of the practical techniques and investigations and so based their answers on general knowledge. Their suggestions were credited wherever possible. Drawing skills were good, although many of the drawings showed the whole specimen not the parts required in the rubric. Detailed knowledge of classification was shown by candidates from some centres.

Candidates should be made aware of the different responses they should make when questions involve terms such as state, describe, suggest, or explain. One of the problems seemed to be candidates giving descriptions when explanations had been requested. The standard of expression in English was sound.

## Comments on specific questions – all questions to be attempted

### Question 1

This question was based on transport in plants, involving knowledge and location of the tissues and planning an investigation.

**(a) (i) and (ii)** The printed diagrams showed TS root (Fig. 1.2) and TS of a stem (Fig. 2.2). Candidates were asked to shade in the tissues where the coloured solution would be found. This coloured solution would be taken up in the xylem. All possibilities were seen on different scripts, ranging from a complete shading of the whole section to just the outer epidermal layers. The more able candidate did complete just the xylem in the centre of the root and the inner half of the vascular bundles of the stem successfully. Some candidates mistakenly shaded only the phloem in both sections and some shaded the xylem in the root and phloem in the stem or *vice versa*.

Most candidates were able to name the tissue involved.

- (b) (i)** This question was generally well answered. Common errors seen included reference to leaves, roots, root nodules, xylem.
- (ii)** Many candidates were able to indicate the root hair zones at the end of the roots by an arrow, as asked in the rubric.
- (c)** It was obvious that some Centres had done more work on planning practical investigations and prepared their candidates much better for this question than others. All possible points covered in the mark scheme were seen.

There were four main types of answer

- Those candidates who were trying to set up two comparable experiments and tried to keep as many factors as possible the same. The able candidates had obviously learned to consider all aspects of the experiment and easily gained maximum marks.

- Those candidates who realised they should do the same experiment with a similar beaker method or a potometer. These candidates gained marks for the measurements and possibly correct references to size of plants and equal volumes of coloured solution, but they did not control environmental conditions such as light or temperature, nor repeat the experiment.
- Those candidates who performed the experiment for the rooted plant as in Fig. 1.1 but then went on to perform the experiment for the rootless plant with a photometer, so they were not able to compare the two.
- The less able candidates who did not perform an experiment at all, but described the expected results and all the processes and pathways involved.

## Question 2

- (a) **Drawing:** Most candidates are now producing diagrams with single clear lines instead of sketches constructed with artistic lines. The majority of candidates no longer use shading, which is encouraging. Some candidates did not read the instruction carefully as there were a range of combinations of parts of the crab drawn, from the required body and back leg [attached or separated from the body] through to the entire crab or to just an eye and a leg. The more able candidates were able to pick out the detail of the jointed leg. The sizes of the drawings were generally larger than the original photograph though a few were equal or smaller than the original.

**Labelling:** The eye was the most common correct label, although a few candidates labelled the stalk and not the eye itself. More able candidates identified the joints or segments of the limb and the pointed end or claw. Unfortunately, some candidates did identify two features of the back leg which would have been correct but they just pointed them out with arrows and did not name or describe them.

- (b) The answers to parts of (b) tended to be Centre specific. Classification is covered in **Section 1** of the Syllabus.
- (i) Many candidates did not know the term Arthropod or Arthropoda, though some tried to spell the term phonetically. The common error was to refer to all three of the animals illustrated as insects or invertebrates.
- (ii) The common features of the three Arthropods were not well known. Many candidates incorrectly referred to antennae.
- (iii) Completion of the table to give one special feature for each animal was often based on the number of legs.

Fig. 2.2 – the feature given was usually correct. Other than legs, the most common to be described was the presence of wings.

Fig. 2.3 - most common feature after legs was the 'segmented body'.

Fig. 2.4 – most common feature after the number of legs was the two parts to the body. Several candidates mentioned the cephalothorax or chelicerae.

- (iv) Candidates need to be clear that correct terminology is necessary in classification. It was in this section that this point needs attention. Insect and Arachnid were better known by more candidates than were Myriopod(a). Many candidates gave incorrect names to Fig. 2.3, e.g. annelids, nematodes.

## Question 3

This question was based on the use of a respirometer to investigate the effect of temperature on respiration of maggots.

- (a) (i) Those candidates who understood that the experiment was dependent upon the respiration of the maggots were able to explain why the drop of coloured liquid moved along the capillary tube towards the test tube, by referring to the intake of oxygen and production and release of carbon dioxide. Only the more able candidates explained the effects of gaseous exchange and absorption of the carbon dioxide by the sodium hydroxide in terms of volume and pressure changes.

- (ii) This was only answered well by those candidates who understood the experiment. Again, here, it was obvious some Centres had taught the principle of a control and many of their better candidates realised the best control was the same apparatus without the maggots. Those candidates who had not fully understood the experiment and the role of the maggots were unable to sort out a suitable control. The most common errors were to remove the sodium hydroxide and replace it with water or even sodium hydrogen carbonate to add carbon dioxide or to remove the clip on the rubber tube to let air in.

- (b)(i) Most candidates were able to plot a line graph using the data in Table 3.1, to show the effect of temperature on respiration. Candidates generally used a suitable pencil and a ruler to construct the graph. A few histograms were noted and a few candidates used colours.

Orientation of the axes was generally correct although there were still some candidates who did not know the correct procedure for choosing axes. This needs to be reinforced.

Axes were labelled correctly by using the column headings in the table, only the weaker candidates did not give complete labels.

The scales for the distance moved in mm on the y axis were generally rather small, so the graph did not fill half of the printed grid, or were too big, so that the full graph did not fit onto the printed grid. Most candidates had made an effort to give even scales. It is not necessary to start the scale from zero. If the horizontal 'x' axis starts at 20 °C and allows 2 small squares for every degree, the scale will fit across the printed grid and if the vertical 'y' axis for distance moved by drop of coloured liquid starts at 40 mm and allows one small square for 2 mm, the scale will fit upwards on the printed grid. Plots using smaller scales such as 4 mm for each small square were difficult to check, though many plots were accurately drawn.

The able candidates either used a ruler to draw point to point lines or made a very good attempt at joining all the points freehand. There were still many inaccurately drawn curves but the majority of candidates lost this mark for extrapolating to zero or beyond 40 where the selected scales allowed. Those candidates with incorrectly orientated axes frequently joined their points in the wrong order, joining the plotted point for 120 mm - 40 °C before that for 168 mm - 35 °C.

- (ii) With reference to the graph, candidates were asked to describe the curve which showed the effect of temperature on respiration. The candidates recognised an increase in the rate of respiration with rise in temperature to the peak rate and then a decrease. Some able candidates supplemented their answers with correct references to figures for rate or to the gradient of the curve or line. The most common error was to describe the effect of temperature on distance moved rather than link it to respiration. This illustrates the need to read the question carefully. Some of these candidates gained credit for correct reference to a change at 35 °C. There were quite a number of explanations attempted but the question referred to a description.
- (iii) Many candidates did refer to the effect of temperature on enzymes in the explanation. Most candidates realised that the maggots were respiring at their fastest rate at 35 °C. Some other candidates thought that this result represented an anomaly or that the maggots were dying.