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# BIOLOGY

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<p><b>Paper 0610/01</b> <b>Multiple Choice</b></p>
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<i>Question Number</i>	<i>Key</i>	<i>Question Number</i>	<i>Key</i>
1	<b>A</b>	21	<b>D</b>
2	<b>C</b>	22	<b>B</b>
3	<b>B</b>	23	<b>A</b>
4	<b>C</b>	24	<b>B</b>
5	<b>A</b>	25	<b>D</b>
6	<b>A</b>	26	<b>D</b>
7	<b>B</b>	27	<b>A</b>
8	<b>B</b>	28	<b>C</b>
9	<b>C</b>	29	<b>C</b>
10	<b>C</b>	30	<b>A</b>
11	<b>C</b>	31	<b>C</b>
12	<b>D</b>	32	<b>C</b>
13	<b>B</b>	33	<b>C</b>
14	<b>B</b>	34	<b>D</b>
15	<b>B</b>	35	<b>D</b>
16	<b>A</b>	36	<b>C</b>
17	<b>D</b>	37	<b>B</b>
18	<b>B</b>	38	<b>A</b>
19	<b>B</b>	39	<b>D</b>
20	<b>A</b>	40	<b>B</b>

## General comments

This year's test proved to be a reliable instrument of assessment, and with perhaps two or three exceptions, all questions made a valid contribution to the overall results. Marks covered the entire range from 0 to 40 out of 40 and, with a mean of 27, the paper was ideally suited to the ability range of the candidates.

## Comments on specific questions

### Question 7

The only likely confusion was to suggest the exact opposite of what actually happens during osmosis. That 25% of candidates should fall into this particular category indicates something of the problems that surround a complete understanding of this process.

### Question 10

This question was on the difficult side, but separated the better candidates from the rest. Those who did not appreciate that a change in pH is most likely to speed up the rate of reaction found all other options attractive.

### Question 12

It may be that the negative form taken by this question caused some of the better candidates a few problems since perhaps the most obvious of the structures to secrete digestive enzymes is the pancreas (the answer favoured by 40%). However, the only structure that does not is the liver and this attracted only 31%, making this the second most difficult question on the paper.

### Question 13

This question begins with a correct statement which is however *not* the answer and it appears likely that many candidates (40%) felt that therefore they need look no further to find the solution. Only 34%, but significantly including the more able, went on to realise that the question is about cells losing their internal pressure and thus the leaves have wilted.

### Question 15

In several fundamental ways, this question, caused problems for candidates. Few selected the correct answer. Many, including almost all of the candidates who otherwise did well on the paper, selected option **C**. The subject material is totally sound and reveals a serious misunderstanding over how transpiration occurs. Candidates should learn that water evaporates from mesophyll cell surfaces then diffuses, as vapour, through the intercellular spaces before leaving the leaf through the stomata during transpiration. Osmosis is not the process responsible for water leaving the cell surfaces as 45% of the candidates believed.

### Question 19

This question was a little difficult but was a good discriminator. Those who did not appreciate that an animal in a small amount of indicator would cause the quickest colour change appeared to guess between **C** and **D** in roughly equal numbers.

### Question 22

Although being largely a straightforward choice between **B** and **C**, it was evident that several candidates who might have been expected to have learnt the distinguishing structural features still managed to confuse a motor with a sensory neurone.

### Question 33

The candidates found this to be the easiest question on the paper which indicated that the fundamentals of food chains are well-understood.

### Question 34

A further question with an ecological bias again served to demonstrate the soundness with which this topic is understood, with over 90% opting for the correct answer.

### Question 37

Some of the more able candidates may have become confused here since they opted for section **A** of the graph as being the time when the greatest numbers are being added to the population. Units are not given on the vertical axis, and whilst it just could be that the greatest percentage increase in population occurs at **A**, it will never be the time when the greatest numbers are added – which has to be during the exponential phase.

<p><b>Paper 0610/02</b></p>
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<p><b>Paper 2 (Core)</b></p>
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### General comments

The overall standard of responses suggested that candidates had sufficient time to respond to all questions and that virtually all candidates found all the questions accessible. Very few scripts were seen that did not show a serious attempt to complete all the questions. The only part that was not always responded to was **Question 5** part (b). There was usually good use of appropriate biological and other scientific knowledge, understanding and terminology.

The standard of written English seemed comparable with that of previous years and few candidates appeared to have problems in expressing their ideas clearly. As has been observed in previous reports candidates should be made aware of the differences in responses that they should make when questions involve terms such as state, describe, suggest, or explain. On this occasion, the main problem seemed to be candidates giving descriptions when explanations had been requested. There was evidence that candidates made use of the information given by the answer space size and the allocation of marks, to tailor their responses appropriately.

### Comments on specific questions

#### **Section A**

#### **Question 1**

Identifying the six arthropods presented very little difficulty to the vast majority of candidates who thus gained maximum credit. The commonest error was to muddle the identification of **B** and **C**, *Aranea* and *Pandalina*. There were a small but significant number of candidates who responded by naming the arthropods using their common names such as crab, scorpion and spider etc. Candidates who did this gained no credit as the question was testing the candidates' ability to use a key and not their skill in recognising the pictures, hence the use of the scientific names for the genera involved.

#### **Question 2**

- (a) Relatively few candidates identified the phase labelled **Y** as the log or exponential phase. There were a number who muddled the log and lag phases, and the inevitable problem of candidates whose writing made it impossible to be clear whether they had written log or lag. The majority of responses were either descriptions or explanations of phase **Y**. Many candidates suggested one reason for the slow population increase, such as, initially there was a small reproducing population or the fact that it takes time for the colonisers to adapt to the new environment, but a far smaller number gave a second reason for the other mark.
- (b) The provision of two lines for each response should have indicated to candidates that a single word response was unlikely to be adequate. There was a considerable number of candidates who gave vague responses such as climate and environment. There was evidence that many candidates did not read the question carefully, and they gave responses about factors that did affect human populations not factors that *did not* affect them.

#### **Question 3**

- (a) Naming the four relevant parts of the female reproductive system without indicating with a label where these were, or labelling the four parts with their names, but not indicating which process occurred there gained no credit. This suggested that the question had not been read with sufficient care. Common errors were to label the uterine wall as the site of implantation and that sperm deposition occurred in the uterus. Many candidates seemed unaware that fertilisation normally occurs in the upper third of the oviduct.
- (b) Overall, candidates seemed familiar with the effects of oestrogen, but there were a significant number who ignored the instruction that their examples could not refer to the parts of the body shown in the diagram. Thus effects of oestrogen on the uterus and ovary gained no credit.

- (c) Although many appreciated that glucose and oxygen could pass across the placenta there was a significant minority who believed that red blood cells could also do this.

#### Question 4

- (a) A large number of candidates did not realise that plants use nitrates to form amino acids and thence proteins. They should appreciate that it is these products that are involved in the growth of cells rather than the nitrates. A small proportion of the candidates recognised that crop plants are removed from fields and effectively take nitrates out of the ecosystem and that these must be replaced if crops are to continue to produce the same yield or that the nitrates lost by leeching need to be replaced.
- (b) It was pleasing that so many candidates appeared to understand the effects of excess nitrates on an aquatic ecosystem and could explain why and how eutrophication occurred. However, candidates should be encouraged to present the events in a logical sequence, starting with the excessive algal/plant growth and ending with the death or migration of the aquatic animals. There were a significant number of candidates who believed that the excess nitrates directly poison either animals or plants. Candidates should also recognise that aquatic environments are only described as marine if the water is salty. In this particular question, a farm pond was involved and this normally has fresh water.

#### Question 5

- (a) Only a few candidates ignored the symbols suggested in the question and utilised others. Also, very few thought that the X and Y chromosomes were directly involved. Those candidates who identified the correct genotypes for the heterozygous state normally gained most or all of the available credit. The omission that restricted many candidates from gaining full credit was in failing to clearly identify the phenotypes of the various offspring. Although there are a number of alternative forms in which a genetic diagram can be presented, in all cases, candidates would make their responses far clearer if they were to label stages in their diagrams. There was evidence that some candidates failed to read the second part of (a) carefully as they presented their proportions based on totals other than 500.
- (b) A relatively small proportion of candidates noted that 20 seeds failed to germinate and they often muddled these with the 120 seeds that germinated but failed to develop into plants. It appeared that many candidates did not relate the events described to their theoretical genetic cross in (a) and that the 120 seedlings that did not develop represented the 25% of the offspring that were homozygous recessive. Many did link the lack of chlorophyll to the inability to carry out photosynthesis and thus, produce food materials that allow continued development. Unfortunately, there were a significant number who suggested that the lack of chlorophyll simply reduced the rate of photosynthesis rather than preventing it.

#### Question 6

- (a) It was not uncommon for lipase to be correctly named, but a weakness in the responses was that many candidates only stated one of the two end products. There was some confusion between glycerol and glycogen. Also, there was a range of other enzymes named as well as totally erroneous end products. In the third part of (a) too many candidates concentrated on the actual colour change rather than suggesting why or how it happened. Although many offered acids among their end products, even erroneously amino acids, they did not link this to the lowering of the pH and thus going below pH 5 to cause the colour change.
- (b) Again, many repeated the information in the question and concentrated on the rate of colour change in relation to the temperature, rather than on the effect of the different temperatures on the rate of enzyme activity and that the fatty acids were released more rapidly. Vague references to optimum temperatures are in themselves inadequate and the data provided was insufficient to be sure that 35°C was the optimum temperature anyway.
- (c) Although many correctly identified the end colours of the additional 20 minutes at 30°C, they failed to offer adequate explanations. There was confusion between the inactive state of the enzyme at 5°C and the denatured state of the enzyme kept at 55°C. Many did not seem to appreciate that the former state is not permanent while the latter is. There was the inevitable error in describing enzymes as being killed, suggesting that candidates believe them to be living things rather than chemicals with particular properties.

**Question 7**

- (a) The majority of candidates were able to identify blood vessels **X** and **Y**. However, there were some who knew both names but muddled which vessel was which, and others who were confused as to whether vessel **Y** was the pulmonary artery or pulmonary vein. A few candidates either overlooked or did not appreciate the fact that the wall of the ventricle of the right of the diagram was the thicker one. Some also ignored this information in part (iii) of (a). This should have helped them to identify the orientation of the heart. Although most understood the role of the heart valves in preventing backflow of blood, there were those who considered the valve flaps act as paddles and push the blood through the heart. The greater thickness of the wall of the left ventricle is necessary to generate greater pressure for the blood passing around the body and it is not to withstand a higher pressure with which it is assumed that blood arrives in this ventricle.
- (b) Many candidates correctly completed Table 7.2, based on their knowledge of the functioning of the heart. Few seemed to have noted that in part (ii), the responses were supposed to be related to the filling of the right ventricle, as many responses for the semilunar valve were based on the right ventricle emptying. However, virtually all candidates failed to support their responses in part (ii) by use of data from Table 7.1. All that was expected was for candidates to recognise that valves were opened or closed by pressure differences on either side of the valve, the data in the table providing the relevant evidence, and to quote the relevant data.

**Question 8**

- (a) Virtually all candidates identified **X** as the sensory neurone with fewer correctly naming **Z**. The success in naming **Y** was far more restricted. A variety of terms were accepted for **Y** including relay, intermediate and connector neurone. Many candidates offered a response as an answer to part (ii) of (a), instead of an effector producing the response.
- (b) Fully correct completions of the table were infrequent, but most candidates recognised that hormonal control was slower than nervous control and that its pathway was via the blood. However, far too many suggested that the nature of a nerve impulse was physical in contrast to the chemical nature of hormonal control. Very few realised that the origin of nervous control was a receptor and instead gave a vague response such as the nervous system or the CNS.

**Question 9**

- (a) The term addictive was often explained in relation to physical, physiological or psychological dependency, or sometimes to the existence of withdrawal symptoms. It is not adequate to explain it in terms of 'being unable to do or survive without it', as this would also apply to substances such as oxygen or glucose. The fact that addicts can break their dependency also points up the inconsistency in this belief.
- (b) There was considerable muddling of symptoms of heroin users with those using other drugs, such as cocaine, alcohol or smoking tobacco.
- (c) This muddling continued into responses about the health risks related to either inhaling the fumes of heroin or injecting it into the blood. The inhaling of fumes was thought to give rise to major damage to the lungs and to cause lung cancer, while the injection of the heroin was vaguely linked to the transmission of disease. Surprisingly, only a minority quoted a specific example such as hepatitis or HIV transmission.

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

As last year, a good standard of papers was seen. The paper discriminated well and all parts of the paper were answered well by many candidates. Very little irrelevant material was written and all candidates completed the paper well in the time permitted. **Question 3** proved to be the most challenging, where candidates were required to consider unfamiliar material, describe it accurately and apply their knowledge to it.

Candidates' work generally continues to be legible and well presented, although some hand writing was so small that it was difficult to read and interpret. The quality of spellings was very variable, particularly in **Question 1**, and appropriate biological terms were not always used, as in **Question 5**.

Please note the change in format for Paper 3 from May/June 2004. Details are emphasised in the syllabus: candidates will be required to answer all questions, for which there will be 80 marks.

Centres will need to be particularly careful that they opt for the most suitable paper combination for each candidate, as the candidate will attempt *either* Paper 2 *or* Paper 3 (not both, as has been the pattern previously). Only those candidates capable of achieving at least a grade D should be entered for Paper 3. Weaker candidates attempting Paper 3 could end up being ungraded.

### **Comments on specific questions**

#### **Section A**

#### **Question 1**

The question discriminated well.

- (a) Parts of a seed were generally well known, with many candidates achieving all four marks. Occasionally, inappropriate terms for the testa were given, whilst shoot and root were sometimes used instead of plumule and radicle. Few candidates could spell radicle correctly.
- (b) About half the candidates managed to correctly name the ovary as the part of the flower in which the seed was formed. Others usually gave ovule or carpel.
- (c)(i) Most were aware of the role of bees in transferring pollen, but fewer were able to state both the source of the pollen (anther) and its destination (stigma), to gain the second mark.
- (ii) A significant number of candidates failed to read the question carefully enough, and gave general features of insect-pollinated flowers, rather than specific features that would attract bees. Sometimes terms such as 'large' and 'colourful' were given without the qualification *petal*. The term smell was commonly given instead of scent.
- (iii) Good candidates described the variety resulting from the genetic contribution of two parents and the possible survival of some offspring in changing conditions. However, answers often implied a prospective advantage to individual plants rather than to the species. Vague references to variation making plants stronger or better were not creditworthy, and statements about dispersal, overcrowding or competition, indicated significant misunderstanding of the term *cross-pollination* on the part of some candidates.
- (d)(i) Many gained full marks here, although some confused the pollen tube with pollen grain (with the grain travelling down the tube) and the ovule with ovary. There was a general tendency to give a standard definition of *fertilisation*, then adding that the micropyle is where it occurs.
- (ii) This straightforward question still drew many incorrect responses about the shoot, or plumule or root growing out of the micropyle.
- (e) This question was answered very well.

#### **Question 2**

The question was generally understood and answered well.

- (a) The vast majority were able to name the elements present in a carbohydrate. Occasionally, oxygen was omitted or nitrogen was added.
- (b)(i) Most correctly stated sweet potato. A few gave 'potato' unqualified.
- (ii) Again, there were few problems here.

- (c)(i) A few candidates named chick peas instead of sweet potato. This tended to be as a result of an inability to handle the relationship between sugars, starch and total carbohydrate.
- (ii) Some overlooked the fact that they were dealing with 500g of vegetable. A few failed to include units in the answer, or used figures for starch in their calculation.
- (d)(i) Most were aware of the high energy content of fats. However, some did not state how this would change the energy content, saying it would be high rather than higher.
- (ii) Many candidates did not appear to appreciate that it is animal fats (or saturated fats) rather than oils that increase the levels of cholesterol in the blood. The stem of the question did qualify the term *oil* with fat to help them make a link. Generally, there were too many vague references to 'fats being bad for you' and biologically incorrect statements about veins and capillaries becoming blocked with cholesterol.
- (e)(i) A large minority of candidates could not calculate the mass of peas needed to provide the recommended daily allowance of vitamin C. A common error was in multiplying 100g by 4 instead of 17.0mg by 4.
- (ii) This was answered well. 'Fruit juice' without qualification occasionally lost candidates the mark.
- (iii) Some candidates named the disease rather than its symptoms, while a surprising number gave the symptoms of rickets, or vague references to poor skin, weak gums, tiredness and loss of immunity. Answers (c)(ii) 58g and (e)(i) 400g.

### Question 3

Candidates tended to find this a much more demanding question.

- (a) Many examinees failed to use the letters on the x axis to make their descriptions accurate enough and little use was made of comparing levels with those at the start. Many attempted to give explanations, although only descriptions were required.
- (b) Answers tended to lack plausible explanations. Few referred to a change in temperature to explain the drop in oxygen or water turbulence to increase it again. The best responses considered respiration by sewage fungus or bacteria to cause the drop in oxygen and higher numbers of algae photosynthesising to increase the level again.
- (c) The reasons given were often not related to the levels of substances shown in the graph. A small number thought that fungi ate algae. Many thought that levels of oxygen would affect algal levels.
- (d) While this was generally answered better, there was some confusion between herbicides and fertilisers and many vague answers about pollution and contamination.

### Section B

Choices revealed that **Question 7** was the most popular **Section B** question and often the best answered, although selection did vary from Centre to Centre.

### Question 4

- (a) Surprisingly, this was generally answered poorly: weak responses failed to distinguish between internal and external intercostal muscles and showed little understanding of the causes of pressure changes. Stronger candidates, however, showed a good understanding of the relationship between volume and pressure. Many wasted time describing the process of inhalation as well as exhalation.
- (b) While most candidates could construct a suitable table, fewer were able to give accurate comparisons (with no percentages quoted) or precise explanations. Temperature differences were often included and vague statements about the body using oxygen or making carbon dioxide were not creditworthy. Few candidates could give a valid explanation for the change in percentage of water vapour.



**Question 5**

This was a popular question, but it rarely gained the candidate high marks.

- (a)(i) A significant number of answers failed to gain full marks because the food chain did not contain *named* organisms, (instead, using general groups such as plant, small fish, big fish, bird) or had very dubious relationships. Arrows were usually used correctly, but while most food chains started with a green plant, some candidates struggled to name a tertiary consumer - opting to end the chain with 'decomposer' instead.
- (ii) Most candidates either described the food chain with the correct terms for the producer and the consumers, or they explained what happened to the energy at different stages. Few did both and the use of biological terms was often disappointing, although the question clearly stated that they were required. Only the really good candidates were aware that energy passed from one trophic level to the next, in the form of chemical energy in food, and that the energy was released through the process of respiration (many suggested that respiration used up the energy). Few were able to offer a figure for the percentage drop in energy at each stage.
- (b) This question allowed candidates to use local examples that were familiar and relevant to them. The quality of answers varied, but significant numbers of very good responses were seen. Some answers, while constructed on sound biological knowledge, contained far too much detail for the marks available. Others were too general, naming trees, cows or bacteria as their chosen organism and oceans or the world for the habitat. A small minority of candidates misunderstood the question and wrote about the value of naming species and the binomial system.

**Question 6**

This tended to be the least popular question and, on average, the poorest scoring one. Candidates needed quite extensive knowledge of the topics to gain high marks.

- (a) Descriptions of the function of the immune system were often missing from the start of the answer, although they were embedded in the response at some point. Candidates could usually explain phagocytosis and antibody production, although poor candidates confused lymphocytes with phagocytes. Understanding of the difference between pathogens and antigens was often weak. Few candidates were aware that antigens are carried on the surface of pathogens or foreign bodies, while the roles of platelets and blood clotting were often considered to be involved in the immune system.
- (b) While some candidates showed a comprehensive understanding of the problems of organ transplantation, most answers contained a few relevant points alongside other vague and general statements. However, some candidates had obviously been taught this topic well, with explanations about the need for using immunosuppressant drugs common in their candidates' answers. A few were aware of the use of data bases, organ donor cards and xenotransplantation in overcoming apparent shortages of suitable donors.

**Question 7**

This was the most popular **Section B** question, often yielding high marks.

- (a) Most candidates could define *tissue*, but examples were not always suitable or correct, choosing blood or skin or leaf. Some candidates focused on the theme of the question and named an appropriate tissue from the diagram.
- (b) Good answers were seen here, although candidates sometimes struggled to name the parts with sufficient precision. The terms *cell* and *tissue* were often used haphazardly. For part **A**, most were unaware that the cells of the upper epidermis secrete the waxy cuticle and few stated its role. Most candidates could name part **B** and many were aware that the palisade cells contain large numbers of chloroplasts. Fewer could describe the shape of the cells. A few candidates failed to see part **D** and details such as, the role of pairs of guard cells in controlling the opening of stomatal pores were infrequent, as were descriptions of the shape and structure of guard cells.

<p><b>Paper 0610/04</b> <b>Coursework</b></p>
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**General comments**

The majority of Centres submitting coursework this year have had considerable experience with it and have now settled down with a suitable range of tasks which work well for them. Most use around eight assessed tasks in total, often assessing two skills on at least some of these. Skill 4 is usually assessed alone, which is sensible as it is difficult to try to extract Skills 2 or 3 from the candidates' work unless the teacher is very experienced.

Most Centres are now using mark schemes in which the criteria from the syllabus are rewritten in a way which links them closely to the particular task being given to the candidates. Some, however, prefer to use tick lists for Skill C1, and this does work well as long as there is awareness that you do not simply count ticks when deciding the level that a candidate has achieved.

In general, the coursework submitted for moderation shows good evidence of how the teacher has marked it and decided upon the level to be awarded. This is not always the case, however, and some Centres tend only to write very brief comments (if any) at the end of the work before writing down the mark given. The Moderators find it helpful to see comments within the work, as this makes it much easier to follow the teacher's thoughts in deciding upon the level the candidate has achieved.

There are still some instances of two skills being confused. This is especially common with Skills 2 and 3. For example, in a few cases the ability to write conclusions has been assessed as part of Skill 2. Mark schemes must be very carefully written to ensure that they address all the components of one skill and do not stray into another.

It is very pleasing to see excellent work from many candidates. The greatest area of weakness is evaluation (part of Skill 3) where comments made by the candidates tend to be rather superficial. This is a very demanding skill, and it differentiates well between candidates who are working at Levels 5 and 6 and those who have reached Level 4.

Some Centres this year appeared to have trouble with administrative matters. Coursework samples from some arrived late, while others did not include vital information such as samples of candidates' work. It is important to get all the paperwork relating to coursework moderation up to date as the course moves along, rather than leaving it to the last minute, when it can become overwhelming. However, most Centres have this well organised.

<p><b>Paper 0610/05</b> <b>Practical Test</b></p>
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**General comments**

It was pleasing to note that few candidates performed poorly on this paper and an encouraging number performed really well, demonstrating an ability to follow instructions, draw graphs and diagrams, analyse and make reasoned suggestions.

It was appreciated that some Centres experienced some difficulty in obtaining suitable specimens. This was taken into account when the grade thresholds for the paper were determined. The fact that Centres supplied information concerning the specimens was useful to the Examiners, as was the inclusion of pictures that were, in some cases, used. Centres are reminded that there is no need to send the actual specimens with the scripts, unless specifically requested, as the packaging can break, releasing the contents of the container into the script envelope.

**Comments on specific questions****Question 1**

- (a) Some excellent and clearly constructed tables were seen. Examiners noted that rulers were more commonly used than in the previous session. Columns and rows in the table should have headings. 'Time' and 'temperature' were frequently omitted, although reference to **A** and **B** were almost always seen. Care should be taken when stating the units used. It was not uncommon to see time measured in 'm'. Presumably the candidate meant 'minutes' but unfortunately stated 'metres' (as this is the accepted abbreviation). Similarly, it is not enough for a candidate to give a temperature as, for example, 45°; °C should be stated. Some candidates apparently had not followed the instructions, as they presented too many or too few results. Also, it was noted that the starting temperature given by some candidates was low, possibly room temperature rather than the initial temperature of the water, which should have been in the region of 60°C. Subsequent readings indicated that water of a suitable temperature had, in fact, been used.
- (b) Good marks were frequently seen for this part of the question. The orientation of the graph was nearly always correct and the axes suitably labelled, frequently with units, even when they may have been omitted in the table. Good use was made of the graph paper, but some candidates used scales that were difficult to work with, resulting in the points being difficult to plot accurately. It is perfectly acceptable to omit low figures on the scale as long as this is indicated in the normal manner and that the part of the scale that is being used for plotting is measured linearly. The lines were generally well drawn and only a few candidates reversed the labelling on the lines.
- (c)(i) Almost all candidates made reference to the fact **A** lost heat and a substantial proportion, however, made some suitable qualification. Many, however, compared this loss with **B**, which was not what the question had asked.
- (ii) Most candidates gained credit for stating that **A** cooled more quickly, but few recognised that **A** had lost more heat than **B**. Some candidates made correct and relevant reference to figures from their data but some candidates did not appreciate that it was the heat loss that was important and simply referred to a lower temperature in **A**, when **A** had, in many cases, started with a lower temperature than **B** in any case.
- (iii) Most candidates referred to less heat loss when animals are crowded and some continued to compare this with a solitary animal. Some referred to heat being gained rather than being conserved and some did not refer to the implications for animals and simply wrote about the test tubes in the experiment.
- (d) Many good suggestions were seen here from candidates of all abilities. The idea of more time was given in the question, so candidates needed to be a little more precise when referring to, for example, allowing the experiment to run for longer so that the effect of cooling could be more clearly seen. Some candidates had the idea that any way in which the experiment was extended was bound to make their results more accurate - e.g. 'repeat the experiment to get more accurate results'. In this case, repeating will simply allow you to calculate means and will identify any aberrant results rather than making the results themselves more accurate. Similarly, using more sensitive or accurate thermometers would neither take advantage of the extra time nor would the extra sensitivity be necessary for this experiment.

**Question 2**

- (a)(i) Clear, large diagrams were drawn by a large number of candidates. Some sketching of the outline was seen. Candidates should be encouraged to use a single line. The three body divisions were not always clearly drawn or indicated in the labelling. As this is a feature that is characteristic of insects it should have been indicated in some way. When the eye was labelled, it was rarely qualified as being a compound eye. About 30% of the candidates labelled the antennae ('anthers' was not credited) and few indicated the presence of six legs.
- (ii) The length of the drawing was mostly measured accurately. Candidates had been asked to draw a line to indicate where they were taking their measurements and this was not always done. In these cases, it might not be clear where the measurement had come from. Some candidates did not include units. The magnification was generally correctly calculated but, as in previous sessions, it was considered that answers to more than 1 decimal place gave a degree of accuracy that was not practical. Some correct answers were negated by the inclusion of units at this stage.

- (b) Some good suggestions were seen here made by many candidates. A common mistake was to repeat information given in the question concerning sinking the container into the ground so that it is level with the ground. Others wanted to include soil in the container for camouflage or 'to make the insect feel at home', but this would effectively decrease the depth and lead to the insects escaping.
- (c)(i) Some poor descriptions of mouthparts were seen, partly due to the condition of some specimens and partly due to poor choice of words. The use was answered with greater success, but Examiners were looking for the idea of cutting or grasping for **W1** and sucking for **W2**. Answers that simply stated the type of food likely to be eaten were not credited.
- (ii) This part of the question was generally well answered. Some candidates only referred to one of the specimens and therefore did not make a comparison. Others failed to notice the 'differences' in the question and stated ways in which the two were similar. Some candidates did not remember that both **W1** and **W2** were insects and made suggestions that did not apply, such as '**W1** has six legs and **W2** has four legs'.

<p><b>Paper 0610/06</b></p>
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<p><b>Alternative to Practical</b></p>
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### General comments

The standard of expression in English was sound. It was not obvious that candidates were unable to attempt the questions or that there was insufficient time for the paper to be completed in the hour allowed. This paper was comparable to the paper for last year (November 2002) in terms of difficulty. All parts to the questions were answered by candidates, but points were spread out amongst different candidates. There were parts of each of the three 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.

The plotting of the graph with three curves was well carried out and very few histograms were seen. Drawing the line was poorly constructed by many candidates. The lines were neither joining point to point accurately by means of a ruled line nor a line of best fit. Either method was accepted for credit if worthy.

### Comments on specific questions

#### **Question 1**

- (a)(i) After the introduction to this question on the first page, most candidates plotted a line graph successfully and distinguished between the three curves by means of a key or labelling the line. A histogram was not a suitable way to handle this data and only few were seen. The candidates were requested to plot a graph, that is one graph and only a very few incorrectly plotted three separate graphs.

The axes of the graph were not always orientated correctly. The time scale should be on the horizontal x axis and labelled as time in minutes. The vertical y axis for temperature readings need not start from zero, as a broken axis could be used to enable a larger scale to spread the results out as much as possible on the printed grid provided. The symbol for the broken axis should be shown otherwise the scale appears uneven. Many temperature scales were plotted from zero and so the three curves were very close together and some candidates used a very difficult scale.

The plotting was generally accurate. It was the construction of the line that was often poor, since the lines were not ruled point to point nor a line of best fit. The points were often joined by undulating free hand lines which spanned the points but dipped in between. The standard varied between Centres. The best curves were those joined by ruled lines between the points. Although the three lines did not cross, it is good practice to use different symbols for each set of data and it was pleasing to note the many candidates that followed that method.

- (ii) This part of the question requested a description of the curve for tube **A**. Only the more able candidates commented on the fast drop in temperature in the first two minutes and then more slowly over the remaining time. The majority stated that the temperature fell overall and many candidates compared this drop in temperature with tubes **B** and **C** which was not needed until the next part of the question.
  - (iii) Most candidates compared the greater drop in temperature for tube **A** with the other two tubes **B** and **C**, but many candidates did not compare tube **A** with the other two tubes individually. Those candidates who did make the full comparison between the three tubes, often went on to work out the actual drop in degrees for all three tubes rather than quoting the final temperatures.
  - (iv) Many candidates did not seem to answer this question, which wanted an explanation of 'how' crowding together of animals in cold conditions kept the ones in the centre warmer, as in the case shown by tube **B**. Instead a description was given, repeating the answer of the previous part (iii) quoting the drop in temperature. The explanation needed to go further and to use biological knowledge of heat transfer by contact, radiation and conduction from one animal to another and the sheltering effect providing insulation.
- (b) This part to the question was not well answered and showed a lack of practical experience of candidates from many Centres. Too many candidates did not try to improve the actual investigation outlined in the question, but altered the experiment completely by changing the number of tubes, the environment - in a refrigerator, the effect of lagging or having a different starting temperature. Some candidates suggested using live animals or to replace the water in the tubes with other solutions including blood.

The idea of repeating the experiment was made to obtain an average reading and more frequent temperature readings were to two common points suggested. A few candidates suggested the use of a covering lid. The other options on the mark scheme were seldom encountered.

## Question 2

- (a)(i) **Drawing:** Many candidates managed to make a reasonably accurate biological drawing of a ground-living beetle, based on the simple printed diagram. The lines were generally good with a minimum of shading. Unfortunately, it was the proportion where many candidates experienced difficulties. A few scaled the diagram, but others made the thorax region unduly large and others included features which were absent in the printed diagram such as an opened carapace. Many of the drawings were large, generally showing the whole animal and most were drawn in the same plane as the printed diagram though some drawings were rotated by 90°.

**Labelling:** Of the insect features, three pairs of legs, three parts to the body (head, thorax and abdomen) were the common labels given. The number of antennae and wings were often not noted. Many drawings were unlabelled and sometimes the candidates labelled the printed diagram and not their own drawing.

- (ii) Magnification of the candidate's drawing was generally calculated correctly. A few candidates omitted the units, but most correctly divided the length of their drawing by the length of the printed diagram and gave the magnification in the correct manner without units. A few candidates still express the magnification as a ratio and others as a percentage.
- (b) This experiment was unfamiliar to most candidates as there were many unsuitable suggestions. Many candidates concentrated on safety issues to prevent harm to the investigators and to the insects. Many suggestions involved placing the traps in areas where the insects were known to be in abundance and to supply food as bait.

The most common answers involved the suggestions of deep containers to prevent the insects escaping and placing fluids such as, methanol, to kill the insects so that the trapped ones were not eaten. Some candidates were aware of the problems of larger predators and frequent checking of traps was suggested as a precaution. Use of a suitable lid was another precaution to exclude the rain, but it must not be tight otherwise the insects would fail to be trapped.

- (c) Most candidates compared the two insects matching features to illustrate three differences. In spite of reference in the question to both insects, there are still some candidates who failed to make comparative statements. There was a wide range of alternative features which were considered.

### Question 3

- (a) This part of the question was well answered, but it was obvious that some candidates had not carried out this type of experiment. The most common method was to enclose the plant in a plastic bag and record droplets of water forming. A pleasing number of candidates mentioned the use of cobalt chloride paper or anhydrous copper sulphate, but unfortunately a few reversed the colour change. Some candidates used a potometer and really measured the rate of water uptake as the bubble moved.
- (b) Most candidates answered correctly, but some thought the bag would prevent the pot absorbing water, to stop the roots carrying out transpiration or to prevent insects entering the pot.
- (c) This part of the question was poorly answered by those candidates who have not had the opportunity to plan investigations and so think about controlling variables except for, in this case, the use of two different plants. It was common for candidates to state that the same experiment was performed with another plant using the same conditions without describing these conditions. It was pleasing to note that some candidates have covered this planning and organisation skill and gave full information in their answers. Some weaker candidates did not follow the question and described different experiments such as using potometers.
- (d) This part of the question was generally well answered with candidates gaining full marks for making three correct observations and describing how these were adaptations for dry regions. There was a wide range of alternative features considered.

There were a few candidates who described three features, but did not explain how the feature aided the retention of water although these gained some credit. Others referred to conditions of heat and wind not lack of water as the question specified.