BIOLOGY

Paper 0610/01
Multiple Choice

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

General comments

The mean mark for this year's test was somewhat higher than in past years, with a few questions being correctly answered by so many candidates that they failed to contribute to the process of discrimination between candidates of varying abilities. It was, however, reassuring to note that the spread of marks covered the range from 2 to 40 out of 40.

Comments on individual questions

1. Although this question was correctly answered by just over a third of the candidates, it was unusual in that it proved to be a straight choice for candidates between options A and B. The satisfactory discrimination indicated that weaker candidates did not appreciate that plants are able to move.

2. Again, there was one answer that failed to attract any candidates, though it was, perhaps, optimistic to believe that any would think that birds have four legs.

3. Statistically, this question was too easy with 92% achieving success, but, in reality, it served to indicate that candidates had a sound grasp of how to use an identification key.

13. The response to this question was slightly puzzling, since some (albeit, very few) of the better candidates appeared to think that there is insufficient carbon dioxide in air to turn limewater cloudy.

18. This question would certainly not have been expected to prove to be the easiest on the paper. A sound knowledge of the functions of at least two of the blood components is required before the correct answer can be selected and candidates are to be praised for working through a considerable amount of material with such success.

19. In contrast, this was the second-most difficult question on the paper. With well over a half of the candidates believing that carbon dioxide is liberated during anaerobic respiration in muscles. More able candidates were more certain of their facts and failed to show confusion.

30. This question demonstrated the value of reading a question carefully before answering it. Even some of the better candidates, realising that it was to do with germination, were too readily attracted to a graph with a shape they recognised as being associated with this topic. Thus, they opted for the graph that shows the change in dry mass of a germinating seed rather than the one which shows, quite clearly, a steady increase in cell numbers during germination and subsequent growth.

35. Unfortunately, this question failed almost totally to achieve the desired results with only 16% opting for the correct answer. The problem would appear to lie in the belief that identification (which occurs under anaerobic conditions) is part of the process of decomposition. It may also be that candidates do not realise that decomposition is a process carried out by aerobically respiring bacteria. Certainly, the question proved far too demanding and made assumptions which, in the event, proved unrealistic.

BIOLOGY

Paper 0610/02

Paper 2 (Core)

General comments

The vast majority of candidates attempted all parts of all questions. Where this was not the case it seemed to occur with candidates who did not seem adequately prepared for the demands of the paper rather than there being insufficient time to complete the questions. Responses to various sections of questions revealed again this year certain misconceptions and misunderstandings that have been reported in previous reports. One point to note is that many candidates ignored guidelines, often printed in bold, in the questions. This was most noticeable in **Question 1 (b)**, **Question 2 (bi)** and **(bii)**, and **Question 8(ci)** and **(cii)**.

Comments on specific questions

Question 1

(a) Most candidates were able to link the production of new individuals with reproduction. The commonest error was to confuse respiration with the pumping of air in and out of lungs (i.e. breathing). When this occurred, the description of respiration was often linked to nutrition.

(b) Despite the word "other" being printed in bold, a significant number of candidates quoted characteristics listed in ***section (a)***.

Question 2

(a) Most candidates realised that the use of wood in a variety of ways, the clearing of land for construction, for transport and for agriculture were common reasons for deforestation. Responses such as "to use the trees" was considered inadequate and should have been qualified with uses such as for fuel, as building materials, for paper manufacture etc.

(b) (i) Too many responses dealt with effects other than those affecting the carbon cycle, which was printed in bold. These included effects on the oxygen content of the air, its humidity and rainfall patterns. It was expected that candidates would comment on the reduction in photosynthesis and the subsequent rise in the carbon dioxide content of the air. A number clearly had in mind the techniques used and commented on the effects of burning and increased decay as a result of deforestation, although references to smoke and soot were not considered valid for credit. There were a significant number who thought that carbon, the element, was a synonym for carbon dioxide.

(ii) Again responses included references to effects on the air and river systems rather than the soil. Those who did deal with effects on the soil were often vague in their responses, referring to "goodness" rather than minerals being removed by leaching. Most responses identified erosion by either rain or wind, but few offered the reduction in humus content or possible desertification in their responses.

(iii) The more common responses were the effects on food chains, loss of habitat and the loss of biodiversity. Many responses were characterised by rather imprecise language that made it difficult for the Examiner to work out what the candidate really knew or understood about ecosystems, and consequently gained little or no credit.

Question 3

(a) Although most responses for **(i)** were correct a very common error was the reversal of the labels for **(ii)** and **(iii)**, the ureter and urethra.

(b) The majority of candidates correctly identified the production of sperm as a function of **X** but far fewer realised that it produced testosterone. Responses revealed a misunderstanding in that candidates seemed to think that sperm and semen are synonymous terms.

(c) Many candidates did not consider the request to "describe" and instead simply named two methods of birth control, although only a few gave responses for methods linked to females such as the use of the contraceptive pill. The sort of response expected was "use of condom placed over the penis" rather than simply "a condom". Many did describe a vasectomy as the cutting of the sperm duct, although in some cases this was linked to cutting a variety of other tubes.

(d) It had been expected that candidates would identify the chromosomes present in males and the transfer of a single chromosome at fertilisation and how this, in conjunction with the chromosome from the female parent, would determine the sex of the new individual. However, there were a significant number who did not respond in terms of the male parent's chromosomes and others who thought that chromosomes, like alleles, are either dominant or recessive.

Question 4

(a) In part **(i)**, many candidates did not realise that if both parents appear red and they produce white offspring, then this feature is due to the recessive allele. Section ***(ii)*** produced a very varied set of responses with all possible genotypes offered fairly evenly and a significant number of candidates giving two or even three genotypes. There were a few responses that ignored the symbols given in the question and selected their own, making it difficult to understand their intentions.

(b) The overriding weakness was that so many candidates ignored the instruction to label the diagrams that they used to explain the inheritance of the flower colour in the cross described in the question. Examiners had to guess what rows of symbols were meant to represent. This limited the credit candidates could be awarded. Those who gave working that led to the correct ratio failed to link this to the original data and thus did not extend their explanations far enough.

(c) A very large proportion of the candidates offered a three to one ratio and often showed their working based on the original cross, rather than on the new cross detailed in this section.

(d) Candidates should be aware that most seeds germinate in the soil and thus light is not a condition needed for seeds to germinate, except in very rare situations such as Grand Rapids lettuce seeds. Many gave effectively the same response twice with answers such as water and moisture or oxygen and air. Unusually carbon dioxide featured in many lists of conditions. Temperature, as an unqualified statement, was considered an inadequate response as this could refer to temperatures below 0 ^{o}C or above 100 ^{o}C.

Question 5

(a) In part **(i)** a common erroneous response was sunlight, which is a form of energy rather than its source, the sun. The majority of candidates identified evaporation but far fewer realised that Y represented transpiration in parts **(ii)** and **(iii)**. Knowledge and understanding about the portion of the water cycle relating to cloud formation in part **(iv)** was generally poor or poorly expressed. Most candidates knew that water vapour became clouds but this was not supported by any science based on cooling and condensation, integral to the water cycle.

(b) Many candidates related water use to photosynthesis or to turgor, though rarely to both. Too often responses were rather vague with responses such as "to make food". Others correctly dealt with its use as a solvent or for transport. However a significant number erroneously suggested it transported particles, such as starch grains, in either the phloem or the xylem. Also many suggested that water was used to cause the transpiration stream, when this is simply a consequence of evaporation.

(c) For this question, candidates needed to describe how root hair cells absorb water rather than their structure. Of those who clearly understood how the process of osmosis occurs, few were able to apply this to the sea water flooding context in part **(ii)**. A small number of candidates correctly suggested that the higher salt concentration in the soil would reverse the overall direction of osmosis and cause wilting or dehydration of the plants. Similarly, very few candidates realised that waterlogged soil lacks air and thus oxygen, leading to death of cells in the root, especially the root hair cells. A common error was to suggest that salt is toxic to living things and that this caused the death of the plants, not thinking about the fact that sea water teems with aquatic life.

Question 6

(a) It was very common to have responses in **(i)** stating or implying that protein was the source of energy for the 14 year old, who was more active than the 30 year old. The link between protein and the growth and repair of tissues was so often completely overlooked. In **(ii)** the link between the need for iron and menstruation in females was often referred to, although not always developed sufficiently to gain full credit. However there were frequent references to the use of iron for strength, both of bones and muscles, and then the data in the table was ignored and the boy was stated to have the greater need. In part **(iii)** many candidates correctly realised that calcium was needed for the growth of both teeth and bones, but again, this was often not developed to include the additional need of the pregnant woman for the fetus as well as herself.

(b) Vitamin C was frequently muddled with vitamin D and thus the wrong role was given in the response. Also many responses such as “its good for the teeth or gums” were considered inadequate.

Question 7

(a) Only a few candidates gained credit in this question, since knowledge of the limewater test for carbon dioxide was generally poor.

(b) Most candidates found this question difficult as there was very limited knowledge or understanding of anaerobic respiration in humans. A common misconception was to include carbon dioxide as a product of the reaction, with the majority of equations having a closer resemblance to that for aerobic rather than anaerobic respiration. In parts **(ii)** and **(iii)**, a few candidates realised that the release of gas caused the bread to rise and others that the high temperature used in baking would kill the yeast and also evaporate ethanol formed. Worryingly, however, many thought that this had the effect of “killing the enzymes”, a serious misunderstanding of the nature of enzymes. In general, the majority seemed unfamiliar with the process of bread making, including the fact that yeast produces carbon dioxide, forming bubbles in the dough which expand, as all gases do, when heated.

(c) The lack of knowledge and understanding of anaerobic respiration weakened the responses to the comparison of the two respiration processes.

Question 8

(a) A significant majority found little difficulty in correctly identifying the five labelled structures. Where errors occurred, these usually muddled the liver, **V**, with the gall bladder, **W**.

(b) A significant number identified bile in part **(i)**, although many found it difficult to identify a relevant hormone in **(ii)**. Typical errors were that urine was thought to be stored in the gall bladder and various enzymes were named as hormones, in **(ii)**.

(c) It was not uncommon for responses to be given as pH values in parts **(i)** and **(ii)** despite that fact that the question requested a named structure.

(d) Although most candidates knew that the red blood cells carry oxygen, knowledge of the transport of urea was generally poor, with considerable confusion in identifying the relevant blood vessels in parts **(i)** and **(iii)**. Some responses gave blood vessels not named or shown in Fig. 8.1.

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Paper 0610/03
Paper 3 (Extended)

General comments

Overall, the Paper was a little more difficult than those of previous sessions. Candidates were usually well prepared for this Paper and writing was, for the most part, legible. Answers were expressed clearly, but candidates did not always write what the question had asked for, therefore not reading the stem of the question carefully enough. Some candidates had difficulty distinguishing between the instructions *explain* and *describe*. Also, vague answers with no mark-worthy statements were common e.g. 'Insulin affects the level of glucose in the blood'. There were some concepts which many candidates struggled with: identifying animal and plant features possessed by fungi, deciding whether or not a process represented an example of genetic engineering, explaining the relationship between water potentials of salty soils and root cells.

Answers to **Question 2** were generally poor and candidates gaining no marks were not uncommon. Knowledge of characteristics of annelids and nematodes varied from Centre to Centre, but some candidates showed good drawing and labelling skills.

Some candidates showed a very high standard in their answers. It was evident that they had been well taught, had worked hard and had a thorough grasp of biological principles. Conversely, there were some who struggled with words and ideas and should have been entered for Paper 2.

Comments on specific questions

Question 1

Most candidates were able to attempt both sections of this question, with many high scoring answers, thus allowing them to relax and gain confidence at the start of the examination.

(a) This was correctly answered by most candidates. Some had to change their answers, which is a much easier process when the lines are completed in pencil. Lines were frequently curved rather than straight. A few candidates confused the xylem tissue and root hair cells.

(b) Candidates needed to relate the definitions of tissue and organ to the example of a leaf given in the question. While the definitions were usually compared, few gave appropriate examples of different tissues in a leaf to support the concept of it being an organ. Sometimes non-cellular parts of the leaf such as *cuticle* or *stoma* were given, or parts that contain more than one type of tissue such as *vein*, or *mesophyll*. *Palisade* and *mesophyll* were sometimes given as different tissues.

Question 2

This was usually poorly answered, in direct contrast to **Question 1**.

(a) Most candidates could state that annelids are segmented, but few could give a second difference. The possession of chaetae by annelids was the most common correct second response. Weak candidates tried to refer to the presence of legs in annelids or stated insect features, or confused annelids with flatworms. Candidates need to be reminded to identify the group to which they are referring. For example, a common answer stating 'One has segments, the other doesn't' gained no marks.

(b) Those examinees gaining two marks usually referred to fungi not being able to make their own food and possessing a cell wall. Many thought that the production of spores or carrying out asexual reproduction constituted plant features. The presence of chlorophyll was often incorrectly stated and many candidates tried to answer the question only in terms of cell organelles.

(c)(i) Some Centres had taught the structure of a virus very well: as a result their candidates had no difficulty drawing the main features of a virus (a strand of RNA or DNA surrounded by a protein coat made up of capsomeres), and labelling them. However, multiple strands of RNA were sometimes drawn, even surrounded by a nuclear membrane. There were also many drawings of bacteria or plant or animal cells with equally inappropriate labels.

(ii) Many answers showed confusion between the types of white blood cell (lymphocytes and phagocytes), or candidates were not aware that there are different types, referring only to white blood cells throughout their answers. Vague responses about HIV destroying the immune system with no biological details were common. Very few candidates outlined how the virus uses lymphocytes to make more copies of itself, or showed any awareness of the inability of a lymphocyte to make antibodies after it had been invaded by the virus.

Question 3

Parts **(a)**, **(b)** and **(c)(i)** were usually answered well.

(a) Voluntary and involuntary actions in the text were almost always recognised. Inevitably, a few candidates got them the wrong way round.

(b) Most candidates could correctly name *muscle* as one type of effector. Better candidates could also name *gland*. Motor (or efferent) neurone was usually given correctly for part **(ii)**.

(c)(i) While phototropism was given by the majority of candidates, some spelt the term incorrectly (phototrophism). The mis-spelling was not accepted because a trophism has a different biological meaning to tropism.

(ii) Many candidates struggled to gain marks in this section – planning experiments was not a strong point. Four valid points were needed to gain the marks available. Many candidates failed to read the stem of the question and did not include the application of any auxin to the plants in their experiment and most suggested using one-sided light, not appreciating that this would provide a source of stimulation in addition to the unequal application of auxin. The most successful descriptions involved removing the growing tips from the shoots (to remove the shoot's natural source of auxin), placing auxin on one side of half of the shoots (leaving the others untreated as controls), placing all the shoots in a dark place and leaving them for a short period of time (up to 3 days). Reference to the use of replicates was also awarded a mark, as was the inclusion of a fair test by keeping all the plants in the same (named) conditions.

(iii) Better candidates were aware that light causes the auxin to move to the shaded side of the shoot, but few explained that this would cause an increase in concentration on this side. Very few stated that the auxin causes cells on the shaded side of the shoot to absorb more water, but many candidates gained a mark for stating that there would be more rapid growth on the shaded side.

(d) Many candidates had no knowledge of how weedkillers work and many did not know the terms *weed* or *weedkiller*. A few recognised that weedkillers are absorbed by broad-leaved plants, stimulating their growth so rapidly that it gets out of control, resulting in the death of the plants. There was often confusion with insecticides and even artificial fertilisers. Very few candidates were aware that weedkillers involve the application of very high concentrations of auxin. No-one realised that a high auxin concentration would inhibit root growth of the weeds.

Question 4

Higher marks on this question were more common.

(a) It was surprising that Examiners saw so few standard definitions of the term hormone. Few described a hormone as a chemical messenger, although most were able to state its secretion from an endocrine gland and many were aware of its transport in the blood stream. Some correctly stated that a hormone stimulates a target organ.

(b) There were many standard descriptions of the control of blood sugar levels, with details about high and low levels and statements about glucagon as well as insulin. This wasted time and restricted how much space was available for giving a description of what the question actually asked for: the role of insulin in controlling blood glucose levels. Candidates need to read the question carefully and plan the answer before committing it to paper. Only examinees who did this gained the four marks available; others wrote far too much irrelevant material. There was some apparent confusion about where insulin controls blood glucose levels: some candidates, perhaps due to poor wording, suggested it was converted in the blood stream rather than in the liver. Some incorrectly thought that glucose was *broken down* to glycogen and others attributed a role to the hypothalamus in stimulating the pancreas to secrete insulin. However, it was pleasing to note that mis-spellings of glycogen and its confusion with glucagon were rare.

(c) The concept of protein being digested by protease in the stomach was well known.

(d)(i) This was often well answered, although many candidates included the gullet in their sequence. Some spellings of bronchus and bronchiole were very poor.

(ii) Most correctly named diffusion as the process by which insulin would pass from the alveoli into the bloodstream.

(iii) Many candidates managed to gain all three marks, although some answers lacked sufficient detail to be creditworthy: the main problem was a failure to qualify *thin* with *walls*. Others referred to semi-permeable membranes, or gave features of the ileum such as folded walls or references to the presence of villi. Occasionally, candidates failed to apply their knowledge of alveoli and gaseous exchange to the transfer of insulin, referring instead to oxygen.

Question 5

(a)(i) Most candidates could state three functions of water in plants, although some answers were marred by vague statements about *plant turgidity* instead of *cell turgidity*, or *temperature control* instead of a reference to a *cooling effect*, or the transport of unidentified substances.

(ii) This proved to be a good discriminator: only the best candidates managed to refer to water potential gradient correctly. However, most managed to gain marks for recognising that the salt concentration in the soil would be higher than in the plant, and that water would be lost by osmosis. Common misconceptions were that plants would become plasmolysed (rather than cells) and that cells (rather than plants) would wilt.

(b)(i) Active transport was well known. A few failed to read the question carefully enough and stated *active uptake*.

(ii) Most candidates knew that energy was needed to pump salts and that this energy was not therefore available for making proteins for growth, but many forgot to state that growth would be slower (again a failure to read the question carefully). Some pointed out that a continual removal of salts from the plant would result in a deficiency for vital processes.

(iii) Almost all candidates could name two mineral salts needed by plants and most could state their functions. Many named minerals that were not on the syllabus and these were also credited, but their functions were rarely correct. Teaching of material beyond the syllabus at this level can be an unnecessary distraction for candidates. Some marks were lost by stating the element instead of the mineral: nitrogen instead of nitrate (or an alternative nitrogen ion), phosphorus instead of phosphate, or giving the chemical symbol. It should be noted that plants use magnesium for the synthesis of *chlorophyll* (many candidates stated *chloroplast*).

(c) The stem of the question stated that the genes in the plant were made more active, so candidates should have recognised that this did not fit the syllabus definition of genetic engineering (taking a gene from one species and putting it into another species) and should have applied their knowledge of this definition in their answer. Vague answers were frequent with few being able to differentiate between making genes more active and transferring them: only the best candidates did well.

(d) Good candidates had no difficulty with this section, referring to soil erosion, or run off into water systems resulting in eutrophication or other pollution. Some described water-logging, and the consequent lack of oxygen, or denitrification. Weaker candidates wrote that plant cells would burst or that plants would die because of the excess water.

Question 6

This was the first time that population pyramids and a graph of survival rates had been used to test the section of the syllabus on population size. Most candidates handled the unfamiliar material well, although some showed language difficulties and wrote about the pyramids as if there was a vertical time axis. References to birth and death rates were common, although these are not extractable from this sort of data.

(a) The question only asked for descriptions, but some candidates tried to give reasons for the variations, or tried to compare the two pyramids. There were many vague and imprecise statements when it was relatively straightforward to quote data from the pyramids to support answers. However, most candidates could state that as age increases, the percentage of total population decreases in the developing country. Some were able to state that a relatively large proportion survives over 65 years old in the developed country, or that the largest group in the population is 40-45 years old, or that the population starts to decrease above 45 years old.

(b) This proved to be more straightforward and most candidates were able to identify a valid difference between the populations at below 15 and over 65.

(c) Most candidates answered this correctly, although responses were often clumsily expressed. Weaker candidates just stated that both decreased, missing the information in the stem of the question.

(d) The inheritance of sex was usually understood and many gained maximum marks, but candidates tend to be lazy in their displays, failing to annotate, circle gametes or separate them sufficiently to distinguish them from the parental 'genotype'. A common mistake was to omit stating which was male and which was female. There were inevitable crosses involving YY x XY. A few attempted to use data from Fig. 6.1, stating that in a developing country at birth there are 10% males and 10% females, which gives a 1:1 ratio.

(e)(i) Once again, the stem of the question needed to be read carefully in order to answer the question. Many ignored this and interpreted the averages as the greatest number of survivors, so 80 and 93 were common errors. The correct ***answers*** were ***54*** and ***74*** respectively.

(ii) Failure to compare the developing country with the developed country was a common inadequacy. Many weaker answers involved vague statements about different standards of living or lack of education. Comparative statements about medical care and food were the most common correct responses.

BIOLOGY

Paper 0610/4

Coursework

General comments

The number of Centres entering candidates for this method of the assessment of practical skills continues to increase. It is encouraging to see a great deal of excellent work, involving good understanding of scientific method and with many candidates confidently evaluating the reliability of results they have obtained in their laboratory work.

Most Centres continue to use around 6 to 12 tasks for assessment purposes. A few use only 4, but this does not appear to provide all the candidates with enough opportunity to act on feedback they are given and to improve their performances as much as they might. The worksheets or oral instructions given to candidates are, in general, relatively brief, allowing candidates to make many decisions for themselves and so demonstrate their abilities at the highest levels of the four skills assessed. Almost all Centres now use worksheets that they have written themselves, rather than 'lifting' unmodified ones from published sources. A few Centres have attempted to assess skills 1 and 4 on the same piece of work. This is not possible because skill 1 involves following instructions, which are not provided for a skill 4 assessment.

Mark schemes appear either as tick lists or task-specific descriptive criteria, with the latter much more widely used than the former. The mark schemes work best when the syllabus criteria have been tightly rewritten to match the task that candidates are carrying out.

It is very helpful to the external Moderator (and also to the candidates) if the teacher's comments appear on the work, which is marked in the normal way – in other words, if *marked* work is supplied in the sample. Some Centres also add 'comment sheets' attached to the front of each piece of work, which is an excellent idea but must be time-consuming. However, the provision of feedback to the candidates will be of great value to them in motivating them and providing clear targets for improvement.

Centres with more than one teacher assessing work, need to apply internal moderation procedures. In general, this is done well. Ideally, it is done *before* the assessment is made, by discussing and agreeing on the task to be given and the mark scheme to be used. One or two Centres found themselves in difficulty after the assessment had been done, and needed to apply internal moderation at that stage, which is never quite so easy nor reliable as if it is carried out earlier.

It is clear that most Centres do assessments within the normal teaching programme, using practical work that candidates would be doing anyway, such as enzyme or photosynthesis experiments. The skill 4 tasks are normally assessed towards the end of the course, and only a few Centres do more than the minimum two. These tasks work best where a clear hypothesis is given, or where candidates are asked to write their own hypothesis. This provides them with a much clearer focus than simply being asked to 'investigate the activity of catalase'. A tightly-constructed hypothesis is more likely to lead to a well-designed experiment.

BIOLOGY

Paper 0610/05
IGCSE Biology Practical

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 can now be found in the Confidential Instructions rather than the question paper itself.

If any difficulty is experienced in supplying suitable material, Centres should contact CIE for advice.

Comments on specific questions

Question 1

This question was testing the candidates' ability to follow a procedure and to record observations, manipulating the results according to the information given to them in the question. Using the results obtained, they were then required to use their knowledge to comment on the results.

(a)(i) A few candidates left the space for the table completely blank. This meant that they lost 6 marks as **(ii)** required them to complete the table that they had drawn. The instructions clearly stated that they should be able to record 5 observations in the table. Therefore, 5 headings were required and each of them should have included units. It was common to see at least 1 of the headings and therefore readings missing. Candidates are reminded that tables should be drawn neatly and that lines should be ruled. They are advised to use pencil for the ruled lines as mistakes can then be easily corrected.

(iii) Most candidates were able to substitute the figures into the formula and perform the calculation correctly.

(iv) Converting the answer to **(iii)** posed a problem for a significant number of candidates. Some chose to multiply by 1000 or divide by 100 instead of dividing by 1000.

(b)(i) Many stated that 'heat was lost' but did not indicate how or where. A number only gained 1 mark because they expressed the same idea again but in a different way. The most common reasons given were the inability to measure volumes or read thermometers, which were not credited.

(ii) Candidates frequently went on to refer to using, for example, a digital thermometer, rather than suggesting more practical improvements to the procedure. Some good answers referred to insulating the tube, grinding the food or eliminating draughts.

(c)(i) To gain the mark, candidates simply needed to transfer their answer to **(a)(iv)** from the previous page, as this was the energy value calculated in kJ per gram. The most common mistake was to multiply their answer to **(a)(iv)** by 2 or otherwise adjust the answer to what they thought would be the value for 1 g. In some cases, however, it was impossible to work out how the candidate had arrived at the figure entered into the table.

(ii) A surprisingly high number of candidates chose to draw line graphs rather than the more appropriate bar chart. They could, however, gain credit for correct axes with units and correct plotting of the data. Few bar charts in which the bars were separate were seen; so few candidates scored full marks even if they had drawn otherwise accurate bar charts.

(iii) Many candidates missed the point of this question. They were expected to use the data from the table and bar chart to come to a conclusion based on the energy content that they had calculated. Many merely stated that the main food content was fat or, less often, carbohydrate with no reference to the data at all. Some quoted glucose or starch, which was not appropriate, as these figures were not supplied. Some tried to justify their choice by finding the combination of food that, when added together, came to the value that they had calculated (e.g. 'it is made mostly of protein and carbohydrate because protein is 2 and carbohydrate is 5 and when you add them together that gives you 7 and the value for S1 is 7.2'). This was incorrect.

Question 2

(a)(i) The majority of candidates produced good drawings with clear outlines. It should be stressed that single line representations of stems and roots is not good enough. Unfortunately, some candidates were presented with specimens in an advanced state of growth and therefore did not have the remains of the seed attached. This was clearly stated as a requirement in the Confidential Instructions. Some accommodation was possible with the mark scheme but Centres are encouraged to clarify any potential problems in advance of the examination.

(ii) A high proportion of candidates do not indicate a measurement line on their drawing. If the length of the drawing is required, then the line should be in a suitable place and the line should be measured accurately and recorded with units. Without the line, examiners are unable to assess the accuracy of the candidate's measurement. Magnification calculations continue to cause problems for many. Working should be shown. Answers should be given to a maximum accuracy of 1 decimal place and correctly rounded to that figure. So a magnification of x1.2 could be correct but x1.23761 or x1.3 (in this case) would not be correct; the first because it is written to too many decimal places and the second because it has been rounded up rather than rounded down. Candidates should also be aware that they are expected to use 'x' or 'times' in their answer and units (such as cm or mm) are inappropriate.

(b)(i) The question required candidates to make a comparison. Some did and provided clear answers. Others either failed to refer to both S2 and S3 either directly or by implication. Some simply recorded an observation and there was no indication whether S2 or S3 was being referred to.

(ii) Candidates struggled to provide two reasons here. The most common incorrect responses were that 'S3 is longer because it is in the dark and is growing searching for the light' and 'S2 has light to photosynthesise and thus makes chlorophyll, so it is green'. This part of the question discriminated as candidates needed to present a clear, unambiguous reason that did not suggest incorrect biology.

(c) Some excellent answers were seen in this part of the question, easily scoring maximum marks. They accurately described the use of clinostats, and their role in removing the effects of gravity, and were familiar with the use of a control. Some responses, however, were very poor and showed a lack of understanding of both the subject material and what was required. Some did not choose to refer to a clinostat but did provide valid procedures to investigate the effects of gravity. The response of the root was expected to refer to the direction of growth. Statements such as 'the root grows towards gravity' were not credited. Even though a germinating seed was specified in the question, some candidates went into great detail of the conditions required for germination or used mature plants. Taking the root of a germinating seed on its own was not considered to be practical. Some lost the thrust of the investigation part of the way through and started referring to shoots and their response to light.

BIOLOGY

Paper 0610/06
Alternative to Practical

General comments

Overall, the paper produced the full range of marks. Candidates attempted all questions and showed that they had adequate time to finish the paper.

The standard of English was high and the presentation of answers showed good understanding of the questions. Some candidates had difficulty with the language for **Question 1** parts **(b)(iv)** and **(c)** and **Question 2**. The drawings generally were well presented, but often unlabelled.

Comments on specific questions

Question 1

(a) (i) and **(ii)** This question was based on an artist's drawing of the mature fruits of *Arachis hypogaea* showing three fully formed peanuts in the sectioned fruit.

In terms of the size and standard of drawing candidates did well showing fruits which were larger than the original. Although the diagram Fig. 1.2 showed shading, there were very few sketchy and shaded artistic drawings seen amongst the candidates' drawings, suggesting an improvement in these skills compared to previous years. Only a few smaller or stylised bean seed type diagrams were seen, though a few candidates incorrectly drew very different fruits such as apple or pawpaw..

Unfortunately, the candidates were not so careful in terms of accuracy. Many drawings looked similar in shape but were not at all accurate in terms of seed number, size or wall thickness in proportion to the seed cavity. The diagram shown in Fig. 1.2 was clear and easy to copy but the observation skills were weak. Some candidates showed a different number of seeds. It should be stressed that when drawing specimens it is important to record accurately what is seen.

Despite the rubric stating – 'to draw a labelled diagram', the majority of candidates made no attempt at all to label the structures and those who did showed a lack of understanding of the structures involved. Others confused the fruit and seed and labelled the seed as both fruit/seed. Some candidates mentioned a number of labels from within a seed, 'cotyledon', 'hilum', 'testa' etc. which were not visible. Candidates should also be encouraged to use a sharp pencil.

(a) (ii) Overall measurements were reasonably accurate but it is important to state the units used. Many candidates had made the drawing a size which made their calculations for magnification easier. Most mistakes for (a)(ii) were seen when candidates gave inaccurate measurements for the diagram which they had drawn. Although it varied from Centre to Centre, the majority of candidates correctly calculated their magnifications and expressed 'x' or times and no units.

There were very few percentages and ratios.

(b) (i)and **(ii)** These sections were well answered. The common error in calculating the energy content was to omit the '100' in the denominator.

(b) (iii) Although the rubric stated clearly ' a suitable graph to compare the energy content per gram of the four food substances **and** the seed', it was disappointing that many candidates did not realise this had to be a bar chart with columns. See page 25 ***section 3 (d)*** of the specification. Overall, in terms of points versus columns there was a definite improvement and many fewer line graphs attempted.

The value for the seed was omitted by many candidates so only the four values were recorded. The scale and labelling for the axes were well chosen and accurate. Some candidates showed the scale starting above zero and as long as this scale was even and the columns accurately shown, this was acceptable.

The majority of candidates showed columns of equal width but not all showed gaps which were equal between the columns. A small number tried to plot mass for each food substance and seed against energy content with unequally spaced columns.

(b) (iv) Generally well answered though a few candidates incorrectly gave other food substances.

(c) The majority realised that Benedict's test was involved for reducing sugar. Common errors included not referring to any method of extraction, adding Benedict's straight away; warming rather than heating or boiling the mixture; giving an end result rather than giving the full details of colour change.

Less able candidates tried to measure the energy content by heating the seed on a pin or using another food test such as biuret.

There was a language problem amongst a small number of candidates who were trying to watch the change in the reagent to show how the sugars in the nut were reducing with time, being used as a respiratory substrate.

Question 2

(a) (i) and **(ii)** These parts of the question were well answered in descriptive terms. Most candidates mentioned observable changes and gained both marks for shoot and root. A small number of candidates referred to figure Fig. 2.1 only and did not compare with Fig. 2.2. The most common error was to try to explain the changes and give full details of phototropism and geotropism, many also referring to auxins. These candidates gave one directional change in growth but did not state a second change in the shoot or root, such as leaf expansion or development of lateral roots.

Only a very few candidates made use of the printed grid in the background, to quantify and described increase in length or other dimension of the seedling.

(b) Many candidates made an attempt at this and did have knowledge of tropisms. There were two types of approach that enabled better candidates to gain good marks here. Some identified the curvature towards light as positive phototropism and went on to describe how this occurred by unequal growth on the two sides and why this was important to trap light for photosynthesis. The other approach concentrated on the mechanism of phototropism and involved the redistribution of auxins. The most common error, even in some of the better candidates was to try to explain the directional growth of the shoot only in terms of negative geotropism or to spend too much time explaining the directional growth of the root which was not needed if the question had been carefully read.. The less able candidate had missed or did not understand 'directional' growth in the question and merely explained the importance of light for photosynthesis and growth of the plant with no reference to curvature.

Question 3

(a) (i) This was well answered overall, with most candidates correctly calculating the total and average/mean to complete Table 3.1.

(a) (ii) Many candidates tackled this section well and presented correctly drawn pie charts. For those candidates who could not do the pie chart correctly the errors seen most frequently, showed all but 'dark and moist', giving the average values 1, 2 and 6 segments and leaving the rest for 'dark and moist'; leaving areas of the pie chart with no label and no value; or dividing the pie chart into four equal sectors and putting a condition in each with its average value or merely guessing the size for the sector.

(b) (i) Well answered by candidates identifying the condition either from the pie chart as intended or directly from the table.

(b) (ii) The majority of candidates made reference to the idea of hiding from predators or to prevent drying out. Common errors were to state that woodlice need moist places to find drink, food or for reproduction. There were some candidates that did not seem to fully understand what the question meant. They seemed to imply that because the woodlice had chosen 'dark and moist' as their preferred condition in the experiment, it was to help the woodlice to find shelter in dark places or under trees in the forest. The candidates were not able to explain how it helps the woodlice survive.

(c) Some candidates recognised that 'reliable' means that the experiment could be repeated to obtain the same results again – so if factors could be controlled more carefully for example the need to keep the temperature the same, or to leave the apparatus for a longer time period for the woodlice to make their choice and so on, is important to this investigation. More candidates have obviously been taught the importance of repeats and taking averages for accuracy which was pleasing and the better candidates were successfully applying their knowledge of experimental procedures to this investigation.

For the candidate obviously less familiar with practical work the most common error was not to make the investigation more reliable but rather to completely alter the experiment so that it was no longer the same investigation by changing the animals, the choice chambers, the conditions being tested etc.