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Group III

Sciences

BIOLOGY

Paper 0610/01

Paper 1 - Multiple Choice

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19	**B**	39	**B**
20	**B**	40	**A**

General comments

Although candidates found a few of the questions this year to be rather difficult, the Paper's overall performance was satisfactory, succeeding, as it did, in spreading the candidates across virtually the entire mark range (2 to 40).

Comments on specific questions

Question 3

Questions on this area of the syllabus normally take a rather different form from the one on this Paper and thus candidates found the requirements of this question demanding. Perhaps the information which followed the colon in each of the options was confusing to some, but it certainly did not appear to hamper the higher-ability candidates.

Question 6

A significantly high proportion of good candidates thought that the uterus is a tissue rather than an organ, but over 80% knew that the ovum is a cell.

Question 10

The knowledge that enzymes are catalysts was shared by candidates at all ability levels, making this one of the easiest questions on the Paper.

Question 11

Almost 90% of candidates realised that the horizontal axis should be labelled either pH or temperature. It was, then, a little surprising that an appreciable number of the better candidates were not able correctly to identify the shape of the graph shown causing them to opt for temperature rather than pH.

Question 12

This question aimed to test candidates' knowledge of xylem function by relating it to the structure of a vessel. Several good candidates failed to link support with the need for thick walls.

Question 14

A confusion was apparent here between transpiration and photosynthesis. The former does not involve gaseous *exchange*. However, over half the candidates felt that there would be more gaseous exchange between the vein and the atmosphere rather than between the palisade cell and the atmosphere.

Question 19

This question may illustrate the importance of the Teacher's advice to 'read the question', since over a quarter of the candidates opted for the answer which gave the composition of inhaled rather than exhaled air.

Question 21

Over three quarters of the candidates were able to make the link between alcohol and liver, but only those who read the question and thought carefully realised that the *breakdown* products of alcohol would first be found in **D**.

Question 24

It is always to be expected that candidates will not think through the process of iris muscle action with sufficient care. This applied to 25% on this occasion - but they were not amongst the more able.

Question 27

There was almost total unanimity amongst candidates that oestrogen is a female hormone and testosterone is associated with masculinity.

Question 29

The answers to this question suggest that there is confusion, even amongst the more able, between dry and fresh mass. A further inaccuracy for many (34%) to believe that length is a valid measurement of growth.

Question 38

This proved to be the most difficult question on the Paper, when it might have been expected that candidates would comfortably link fertilisers with increased growth of plants, whether crop-plants or water-plants.

Question 39

This question caught out those who did not realise that the sequence of organisms in the bar chart is the reverse of that in the food chain - emphasising the need for careful thought before answering.

Paper 0610/02

Core Theory

General comments

The standard of responses was pleasing with the use of a good deal of appropriate biological terminology. Very few candidates failed to make a serious attempt to respond to all parts of all questions. There were a number of question sections in which it appeared that candidates did not read the question with sufficient care as evidenced in **Questions 3 (a)**, **4 (b)** and **7 (b)**. The standard of written English seemed comparable with that of previous years and few candidates appeared to have problems in expressing their ideas. Most candidates appeared to have noted the size of the answer space provided and the mark allocation, and judged the breadth and depth of their responses accordingly. There was no evidence to suggest that candidates were unable to complete the Paper because of lack of time. Some candidates did not appear to have checked that they had used material in the stem of the question or had actually answered the question set.

Comments on specific questions

Question 1

Almost all candidates completed this question but rather less than 50% gained maximum credit. The ability to handle the grid varied considerably. The commonest error was usually a failure to complete the grid as requested before filling in the names of the fish. Almost everyone identified the Greenland shark but the Hake, John Dory and Sea Bream were frequently confused. A significant number of candidates did not indicate in the table the positive responses, four ticks, in response to **1 (a)** in the key.

Question 2

(a) This was a straightforward question but some candidates responded by naming a blood vessel, not a chamber of the heart and knowledge of heart structure and functioning was very poor. A significant number of candidates failed to respond to this question.

(b)(i) A significant number of candidates failed to attempt this section but those who did usually managed to complete the calculations, correctly identifying that in both cases there was the same cardiac output.

(ii) There was considerable evidence of careless reading of this part of the question. Many candidates did not appreciate that they were expected to compare the data for the two people at rest and instead compared them during exercise. A number mistakenly suggested that training would cause an increase in the resting heart rate. Also a number, having recorded identical cardiac outputs in the table, commented on the difference in cardiac output at rest!

(iii) Most candidates gained some credit here for a relevant comment on the effect of maximum exercise on trained and untrained people but some failed to note that a comparison was needed. Comments such as “the heart beats rapidly” were inadequate. Candidates should also avoid the use of vague terms such as “healthy”. Candidates totally ignored the instruction to use the data and failed to manipulate the data to support their statements.

(iv) This was answered quite well but again vague terms such as healthy were used without further explanation. Some suggested that all forms of heart disease could be prevented by exercise. Many also confused strokes with heart attacks.

(c) Candidates were expected to consider the additional energy requirements of the muscles when carrying out exercise and the role of the heart in supplying these needs. The mark allocation should have indicated that some expansion of the basic concept put forward was required. There seemed to be misunderstanding of the concept of “energy” and the term was often used incorrectly. Candidates should appreciate that respiration does not produce or manufacture energy nor does the circulatory system deliver the energy needed by the muscles. A number seemed to believe that oxygen was the source of chemical energy in respiration. Also candidates should realise that the higher cardiac output during exercise reduces the need for anaerobic respiration and that the repayment of an oxygen debt occurs after the exercise has been considerably reduced or has finished. However many candidates scored well in this section.

Question 3

There was some confusion in this question with candidates repeating the same information in **(a)** and **(b)**. It would be sensible to encourage candidates to read the whole question before beginning a response. It is very unlikely that exactly the same material will be needed for two responses.

(a) Few candidates considered what might be in the water from treated sewage, with most writing about bacteria, lack of oxygen, excreta or eutrophication. It was clear that many were thinking about untreated sewage. Treated sewage has a raised nitrate and phosphate level as a result of the treatment process and may also contain additional minerals from detergents or even industrial waste.

(b) Once again adequate study of the mark allocation and the use of the word "explain" in the stem should have made it clear that that a simple statement that "the death of organisms in the river occurs" would be an inadequate response unless at least some of the events leading to their death were detailed. Accounts of eutrophication were very varied in quality and some candidates implied that decaying plant material formed bacteria, spontaneous generation! A significant number of candidates thought the death of water animals was due either to diseases caused by bacteria or to poisons in the sewage, not to anaerobic conditions. Candidates often used the term marine to describe the organisms in a river and they should appreciate that the term aquatic is a better descriptor as the bulk of the water in most rivers is fresh and not saline. There were many references to plants using up the oxygen in the water during photosynthesis!

Question 4

(a)(i) The majority of candidates completed the calculations correctly, although there was a wide range of other numerical answers that did not seem to relate to any of the given data and that could not be explained by simple errors in the basic calculations.

(ii) A suitable group of organisms, such as decomposers, bacteria, fungi, omnivores etc, was usually identified. Candidates should note that while decomposers are a group of organisms, decay is the process brought about by them not the organisms themselves.

(iii) The source of the energy is the sun. Light was an unsuitable response as it is the form of energy not its source.

(iv) Many seemed uncertain what was required here. Candidates were expected to suggest ways in which living organisms lost energy to the environment not to describe death or decay or uses of the energy within the organisms. Many seemed to think that plants lost energy by photosynthesis.

(b) Once again the need to compare two types of energy loss in two different organisms was not appreciated. To gain credit comparisons were essential but few candidates made them. The most common response referred to energy utilised by the herbivores in movement which does not occur in plants. Comments on the homoiothermic nature of mammals and their consequent loss of heat to the environment were few and the idea that mammals have a higher respiration rate than plants was even rarer.

Question 5

(a)(i) Many candidates completed the graph correctly. A significant number failed to attempt it at all. The commonest plotting errors were for age 2 or for ages 20 and 25.

(ii) Only a minority of candidates appreciated that the steepest slope on the graph was between 0 and 2 years and that this was when growth was most rapid. An overwhelming number of candidates gave 5 – 10 years as their answer. The greatest change in height, as shown by the table, occurred during this period. Candidates clearly forgot that this was a five year period span and that rates of growth must be compared between consistent time periods such as "per year".

(iii) Many responses in this section suggested that candidates had not read their graphs with sufficient care or tried to deduce it from the table. The latter seemed the only possible explanation for those who did not plot any of the female height data.

(iv) Most read the age, at which this height was reached, accurately.

(b) Most candidates clearly knew the secondary sexual features of females but some lost marks by careless or casual comments such as 'develop hair' which was considered too vague. Candidates should distinguish between changes that occur during puberty to existing features, such as widening of the hips, enlargement of the uterus and increased production of the sex hormones, and features that first occur at puberty, such as ovulation, menstruation and the formation of breasts.

Question 6

(a) Most candidates named the three parts correctly, although a minority were convinced that B or C must be the ureter. Those candidates who produced hybrid names such as 'urether' or 'ureather' for C, the urethra, failed to gain credit.

(b)(i) Many candidates confused the symptoms of gonorrhoea with those of syphilis. Inflammation of the urethra or the production of a greenish or yellow pus-like discharge were acceptable but not a white discharge or a yellow liquid! If pain or a burning sensation was mentioned the candidate should have explained that this occurred during urination.

(ii) Most candidates suggested a long-term effect would be sterility although a significant number thought the condition would be fatal. A number of candidates seemed to equate impotence with sterility.

(iii) A significant number of vague responses such as "see a doctor" or "take tablets/medicine" were seen and a number of candidates seemed to think thorough washing can get rid of the disease. Vaccination was also suggested as a cure. Those who mentioned drugs usually specified antibiotics.

(iv) The advice to use a condom was well known. References to unspecified methods of birth control were not considered worthy of credit. The wording of the question precluded "abstinence" as a valid response.

Question 7

(a)(i) A precise definition was required. Candidates were expected to specify a group of similar cells carrying out the same function. Many definitions contained inadequate information and some simply stated that cells form tissues or that tissues form organs.

(ii) Once again responses were often too vague. Most associated xylem with water but a significant number thought it was responsible for water uptake rather than the transport of water. The second main function of xylem is support. Many candidates chose to offer an explanation and in doing so they revealed that they thought that this was related to turgor rather than the woody nature of the vessel vessels.

(b)(i) Very few candidates recognised ciliated epithelium and a number failed to note that they were asked to identify the tissue not suggest where it was found. "Villi" was a common erroneous response and this was often accompanied by allied responses in **(ii)** and **(iii)**.

(ii) Most candidates failed to read the question properly and talked about how ciliated epithelium functions in the airways, not in the oviduct.

(iii) Few managed to give a correct response to this question. Once again, many failed to read the complete question with sufficient care and quoted the oviduct or the fallopian tube, as if this was a different structure.

(iv) Only about half the candidates named nicotine as the chemical concerned, with a significant number suggesting that carbon monoxide had this effect.

Question 8

(a)(i) The majority of candidates managed to complete the table correctly, however a few read the measuring cylinders correctly but then filled in their readings in the wrong boxes. There were a number who recorded the response 55 as 50.5 and others whose responses suggested that they had not looked at the printed scale with sufficient care. There was clear evidence from the "original level" responses that some candidates read their answers from the very upper point of the meniscus and not from its main level.

(ii) Most identified the number of leaves or amount of leaf surface as the relevant variable.

(iii) Many seemed unfamiliar with the concept of the experiment and many tried to use a different apparatus or coloured water. Many of those who covered the top of the measuring cylinders often either erroneously totally enclosed the leafy shoot or did not explain how the leaves would still be exposed to the atmosphere.

(b) The vast majority stated three correct environmental factors. The commonest error was to either quote two versions of the same factor such as "wind" and "no wind", to quote the availability of water (in the cylinder/soil) or to quote internal features of the leafy shoot.

Question 9

(a)(i) The type of enzyme was usually identified correctly.

(ii) To gain credit here candidates had to compare pH in the stomach with that in the small intestine. A comment on only one of these was inadequate unless a comparative term was used. There was evidence that acidic conditions are thought to have a higher pH than neutral or alkaline conditions suggesting poor familiarity with the pH scale overall by some candidates.

(b)(i) The majority identified the liver as the site for storage of excess glucose, with a small number suggesting muscle cells. The term cells without qualification was inadequate.

(ii) Most candidates knew glucose was stored as glycogen but poor spelling caused confusion between this and glucagon or glycerol.

(c) Some candidates gave very full and accurate responses to this section but others described the absorption of amino acids from the villi rather than the removal of excess amino acids from the body. Many thought that deamination occurred in the kidney, and there clearly was some confusion between urea and urine. A significant number suggested that the excess amino acids were removed via the faeces and even a small number who, ignoring the statement in the question, stated that they were stored in the body.

Paper 0610/03

Extended Theory

General comments

The quality of answers continues to be variable. While the responses from the better candidates were pleasingly good, consistency was often a problem – it appeared that the syllabus had not been studied to the same level for all topics. **Questions 2** and **4** were generally answered poorly due to lack of knowledge of the topic rather than the level of difficulty of the question.

Candidates need to be encouraged to plan out their answers mentally before committing them to paper. The spaces provided on the Question Paper are there as a guide to the succinctness required in the answer. Too many answers spill on to margins or to the bottom of the page, often after a first attempt has been written and crossed out. Candidates sometimes failed to gain a mark because the answer lacked sufficient detail, although the correct basic idea was given.

Examinees tend to be very poor at annotating diagrams that they have obviously spent a lot of time learning. This is a shame because a simple statement linked to each label on a diagram can be rewarded with marks that are otherwise missed. It also improves a candidate's understanding of, for example, the functions of parts of a flower or the role of auxins in a shoot.

Centres are asked to encourage Invigilators or Examinations Officers to avoid using staples. Some Centres are using very thick answer booklets (sometimes of 24 pages). These are very expensive to send, extremely heavy to handle and very wasteful – most candidates sitting this Paper need only three sides of paper to complete ***Section B***. Candidates should be instructed to write the numbers of the ***Section B*** questions they have attempted in the grid on the front cover of the Examination Paper.

Comments on specific questions

Section A

Question 1

(a) The quality of answers varied greatly. Some candidates had learned these definitions very well, but the majority lacked the accuracy required to gain marks. Frequently, only the organisms were included in details about an ecosystem, omitting necessary references to the environment in which they live. Answers often referred to a single population instead of communities. Few acknowledged that an ecosystem includes more than one habitat. Many definitions of food webs showed that these candidates did not know the difference between a food web and a food chain. Few described included links between food chains.

(b)(i) The majority named both impala and locust. Some only named one herbivore, despite the question requiring the herbivore<u>s</u> to be identified.

(ii) Again, the quality of answers varied. There were a number of acceptable ways of describing that the leopard was feeding at different trophic levels in the two food chains in the food web, but some candidates had difficulty in expressing quaternary consumers (numbers for the levels were accepted by Examiners) or the levels at which the leopard's prey were operating. Vague answers describing the leopard as a top consumer or eating two animals were not credit worthy.

(c) The term *plague* confused some candidates, who associated it with disease rather than huge swarms. However, most gave good answers. Where marks were dropped it was often because the answer was too vague, explaining the change in numbers in terms of a change in availability of food rather than naming the food source.

(d)(i) Most candidates recognised that, because impala numbers would drop, the leopards would have less impala to eat and would then eat more baboons to survive. Alternative answers were also accepted. For example, some argued that the locusts would migrate once the grass had all been eaten, so scorpion levels would drop and there would then be less food for the baboons; another viable answer referred to insecticides being used to control the locusts that then passed up the food chain, reaching lethal levels in the baboons.

Many candidates lost a mark through poor wording, for example stating that the leopard would *start* to feed on the baboons or by using the term *food* without qualifying it.

(ii) A range of suggestions were seen and accepted. The most common referred to disease, named changes to the environment and lack of reproduction.

(e) A good range of suggestions were offered, including references to possible extinction, the benefits of increased tourism, damage to the food web and problems resulting from increased baboon or impala numbers. Some misread the question and gave reasons for hunting.

Question 2

(a) Knowledge of nerve cell structure was very limited.

(i) While most candidates recognised the cell to be a motor (neurone), some named the wrong type of nerve cell, or merely described it as a neurone.

(ii) This was generally poorly answered: distinguishing features of a motor neurone were not well known. Few stated that the cell had motor end plates, had a long axon, the cell body was at the end of the cell, or that the cell body had dendrites attached.

(iii) Few candidates were able to describe accurately the position of a motor neurone in the nervous system. The vast majority gave spinal cord, brain or CNS only, with no reference to the peripheral nervous system or attachment to muscles or glands.

(b) This question achieved better responses, though few gained all four marks available: two succinct and relevant statements were needed for cytoplasm and for myelin sheath. For cytoplasm, the most common responses referred to it being the site of metabolic reactions while for myelin sheath, its insulating properties were generally stated. Many candidates lost a mark by referring to the myelin sheath 'protecting the cell' or 'keeping heat in the cell'. The term 'impulse' was not always used – *messages* and *stimuli* were poor, inappropriate terms given too frequently.

(c)(i) Candidates coped best with this part of the question. Common errors involved the reversal of stimulus and receptor, or response and effector.

(ii) Responses to this were variable. While many candidates gained full marks without difficulty, others had problems, particularly with the term effector – often named as the pupil, or confused circular muscles with ciliary muscles. Some ignored the fact that the question was about the pupil reflex and made up their own example of which to identify the parts (perhaps misinterpreting that the term *pupil* referred to themselves).

Question 3

Candidates tended to achieve higher marks on this question, showing more familiarity with the diagram of the villus.

(a)(i) References to absorption or transport were usually given for one mark, but names of materials involved were less frequently accurate: too many candidates gained no marks for naming materials absorbed or transported in either capillary or lacteal. Vague references to digested food or fat were too common.

(ii) Most correctly stated that the microvilli would increase the surface area of the epithelial cells. A few mistakenly associated the microvilli with ciliated cells in the respiratory system and suggested they would help to remove germs or mucus, or move food along.

(b)(i) While most correctly stated *diffusion*, weaker candidates often gave absorption or, less commonly, assimilation, osmosis or active transport.

(ii) Again, precision in answers was often lacking: too many answers referred to capillaries being thin, having thin cell walls or having semi-permeable membranes. Accurate responses described the capillary walls being one cell thick, the presence of pores or the permeability of the walls and the large number to provide a large surface area for diffusion. Some excellent answers described the proximity of the capillary to the epithelium of the villus to reduce the distance for diffusion.

(c)(i) Most managed to gain a mark by stating that concentration of substances in the capillary could be higher than in the ileum. Fewer attempted to gain the second mark by explaining the effect this would have (materials would have to be moved against the concentration gradient).

(ii) This question successfully discriminated between the best and weaker candidates. Few could link their knowledge of active uptake and its energy requirement with the process providing the energy – respiration. To gain 2 marks candidates needed to state that the respiratory poison would prevent respiration, so no energy would be available for active uptake. Weaker answers assumed that the respiratory poison would affect oxygen levels, perhaps confusing respiration with breathing. Some thought that stopping active uptake would be a mechanism to prevent the poison being absorbed into the body.

(d) Surprisingly, few candidates could name two other functions of the lymphatic system. Examiners awarded marks for references to the production of lymphocytes or fighting disease, the return of tissue fluid to the blood stream, transport of fatty acids or glycerol and the prevention of pooling of tissue fluid.

Section B

Question 4

This was not a very popular question, and most of those attempting it did not score very highly.

(a) Many answers showed a lack of understanding and precision. The phrasing of the question was deliberately kept general so that candidates could refer to the effect of light or gravity in their answer. While a limited number of candidates had studied this topic well, few could describe where auxins are produced in a shoot, what happens to them when the shoot is placed horizontally or their effect on individual cells in a shoot. References to diffusion, phototropism and geotropism were not often used and the latter two terms were rarely qualified with *positive* or *negative*. Many answers included irrelevant detail about the effect of auxins on roots, wasting time that could have otherwise been available to plan other answers. Diagrams rarely improved answers due to the usual lack of annotation.

(b) Most candidates performed better in this section, although knowledge of the roles of the hormones in the menstrual cycle was stronger than their roles in pregnancy.

(i) The sites of production were well known. Most candidates were aware of their functions, but often poor wording let answers down. For example, oestrogen was described as being responsible for building up the wall of the uterus rather than the *lining* of the uterus. Some candidates were unable to distinguish between the roles of oestrogen and progesterone, making identical statements for both. Marks were also thrown away by candidates regurgitating a paragraph (probably learned off by heart) about the menstrual cycle without stressing the roles of the hormones in it. So, for instance, the increase in oestrogen levels after menstruation and repair of the uterus lining would be described without linking the two together. Similarly, a description of the breakdown of the lining at the end of the cycle and a drop in progesterone levels was often given, again with no link between the two. Statements are not awarded marks if they are not in context.

(ii) Fewer answers achieved high marks in this section. Candidates often stated that oestrogen plays no role during pregnancy: Examiners do not ask trick questions! The role of the placenta in secreting the hormones was not well known. Marks were usually gained for stating that the hormones maintain the uterus lining, prevent further ovulation or stimulate milk-producing tissue in the breasts.

Question 5

While this should have been a straightforward question to answer [particularly part **(a)(i)**], few candidates managed to achieve full marks. However, reasonable marks were gained, even by weaker candidates.

(a)(i) Much time was wasted by candidates giving full details of the features of insect-pollinated flowers (often in greater detail than wind-pollinated flowers). The question did not require a comparison. Again, accuracy was lacking in many answers, with wind-pollinated flowers being described as having white petals rather than dull, or green, or brown, stigmas being hairy rather than feathery, carpels being exposed rather than stigmas exposed, filaments being large rather than long. The term anther was sometimes confused with pollen, while bracts were rarely named. Many candidates spent time unnecessarily copying the diagram already given in the question (with no annotation), followed by a drawing of an insect-pollinated flower. This improved the answer in only a tiny number of scripts.

(ii) Candidates often coped well in this section, gaining maximum marks with accurate references to the size, weight and surface characteristics of the pollen. Weaker candidates were prone to confuse pollen with wind-dispersed seeds, sometimes even drawing sycamore and dandelion fruits.

(b) Many answers contained descriptions of the process of self-pollination rather than the advantages and disadvantages. Others confused self-pollination with asexual reproduction. Poor wording was often seen. For instance, candidates from some Centres described diseases being passed to the next generation rather than the next generation being less likely to adapt to become less susceptible to disease if they were self-pollinated. Some suggested that self-pollination would result in no variation rather than little variation.

Question 6

(a) The quality of definitions varied, with some candidates giving details going well beyond IGCSE Level and others struggling to gain a single mark. Few stated that respiration occurs in cells or included references to mitochondria. There was the usual confusion between respiration and gaseous exchange with some individuals, along with references to the burning of food or sugar.

(b) Even the weakest candidates scored well in this section, creating a table with suitable headings and making two or three appropriate comparisons between the two forms of respiration (usually associated with the use of oxygen, the relative amounts of energy produced and, less frequently or accurately, the other products of the reactions). A common error was in stating that carbon dioxide is also produced with lactic acid. Some confused lactic acid with pyruvic acid.

(c) The mark scheme offered a wide range of alternatives to allow candidates to score full marks but, nevertheless, this was rarely achieved. Yet again, poor wording and biologically incorrect statements were to blame. Far too many candidates incorrectly stated that capillaries or veins show vasodilation or move closer to the surface of the skin. In fact, arterioles dilate, allowing more blood to pass to the capillaries near the skin surface. Capillaries cannot carry out vasodilation or vasoconstriction since their walls are composed of a single layer of epithelial cells (not muscle cells). Details of how the evaporation of sweat from the skin surface results in a cooling effect were usually inadequate. Few candidates named the hypothalamus or stated its role in detecting a rise in body temperature.

Question 7

This was the most popular question. Most candidates who chose it scored reasonable marks, even though the definitions tended to be poorly worded.

(a) Those who had learned the definitions associated with genetics had no problems with this section. Weaker candidates usually managed to gain some marks when defining the terms *homozygous* and *heterozygous*. When definitions of phenotype and genotype failed to gain marks it tended to be because the answer did not refer to the individual or organism. Many candidates had difficulty distinguishing between the pairs of terms without actually using those terms in their answers. The biggest problems were in confusion between the terms *chromosome*, *allele* and *gene*: the difference between them was not understood by many candidates, making definitions of *dominant*, *recessive*, *homozygous* and *heterozygous* difficult to state clearly. Vague descriptions of stronger and weaker genes were too common.

(b) This was often well answered. Unfortunately, some candidates chose to use sex determination as an example: this is a chromosomal cross rather than a genetic cross. Sometimes the named example was not stated clearly. For example, 'black crossed with blue', without stating the feature or organism involved. Other crosses were implausible. For example, for **(i)**, 'A tall person crossed with a small person', showing that the candidate was not aware that height in humans is an example of continuous variation, controlled by a number of genes as well as the environment. A cross between heterozygous tall and short pea plants would have been suitable, with tall being identified as the dominant allele. In stating the parental genotypes, the cross was often omitted. Sometimes the lines showing how the offspring were derived from fusion of the gametes were missing when using the traditional format and the phenotypic ratios were stated without clearly demonstrating how that conclusion had been made. Candidates need plenty of practice in setting out the parts in a genetic cross step by step. Some candidates wrote a paragraph about suitable crosses without actually displaying them.

Paper 0610/04

Coursework

General comments

Most Centres are using a very good range of tasks, giving their candidates excellent opportunities to demonstrate their abilities in all four skills. In general, about 8 or 10 tasks are used, mostly to assess just one skill at a time, but sometimes assessing 1 and 2 or 2 and 3 together. Skill 4 is almost always assessed alone, often only on the minimum two occasions, reflecting the time demands of planning and carrying out individual investigations.

Most mark schemes are very carefully constructed, using the general criteria and rewriting them to match the specific task precisely. Very few Centres now confuse aspects of more than one skill, though this is still a problem for some new Centres and always needs careful attention. A few Centres use tick lists, especially for Skill 1. These can work well, but great care is needed in ensuring that the candidates' work is marked according to the *level* achieved, and not just by adding up numbers of ticks indiscriminately.

Candidates do very well on Skills 1 and 2, as might be expected. Skill 2 tasks tend to fall into two types - either the observing and recording of biological specimens, or the measurement and recording of numerical results. Many Centres provide both types of task, which is excellent practice. Where numerical results are to be recorded, the best tasks involve something of reasonable complexity - not, for example, just two numbers to be recorded. Assessment here needs to include the candidates' accuracy of measurement, not just their results charts.

In Skill 3, graphs are sometimes assessed a little more generously than should be expected. Lines do need to be very carefully drawn, either by ruling accurately between points, or by drawing a best fit line where this is justified. Candidates scoring 6 should be expected to comment fully and appropriately on the major sources of error; this is rather weak in some Centres. It is a high-level skill, and needs to be addressed very specifically if candidates are to develop their abilities here.

Paper 0610/05

Practical Test

General comments

One question was not favoured above the other by the candidates as both produced similar ranges of marks, although it was not uncommon to see an individual candidate with a low score on one of the questions and a high mark for the other.

Candidates are reminded that diagrams should be drawn in pencil, as large as possible and with clear lines. Label lines should extend to the structure being labelled to avoid ambiguity.

Care should also be taken in following the instructions given. It appeared that, in **Question 1**, some candidates did not chop the first potato sample finely.

Comments on specific questions

Question 1

(a)(i) Some very good, clear diagrams were seen but in some cases the buds and shoots were barely recognisable. Buds and lenticels were frequently not clearly distinguishable.

(ii) It was rare to see more than one mark here, those scoring two mentioning both storage and reproduction.

(iii) The most commonly recognised feature was a bud. Few candidates referred to leaves. Weaker responses referred to outgrowths, which was not credited.

(b) Candidates tended to describe the frothing but few gave the idea of a vigorous reaction. The tendency was to describe the appearance by the end of the two minute period rather than what happened during this time.

(d)(i) This graph required the use of the readings from **(b)(i)** and **(c)**. Some candidates had recorded these in cm rather than in mm and so lost marks here. The graph stated in the question was a bar graph, so line graphs were not acceptable. Some candidates experienced difficulty in transferring the readings taken onto the graph, plotting them incorrectly or reversing them. A significant number included time as one of the axes.

(ii) Many candidates were awarded two marks in this section, for recognising the greater amount of froth with the chopped sample and that this sample had a greater surface area. It was not appreciated by the vast majority of candidates that solution **Y** was the substrate and that it was broken down by the enzyme released from the cut potato cells. Indeed, many commented that the potato was the substrate and that solution **Y** was acting upon it.

(e)(i) Candidates did not appreciate that the question related to the presence of an *enzyme in specimen* **X**. Examiners were looking for the idea that the potato could be boiled (to denature the enzyme) and, once cool, could be used in a repeat of the previous experiment. Candidates were expected to realise that amounts of potato and amount and concentration of solution **Y** should be the same. Various suggestions about using different or inanimate material were made, but they did not answer the question. Some candidates wanted to heat the experimental mixture, but that would have just increased the rate at which the hydrogen peroxide would decompose and would not be likely to result in stopping the production of bubbles and so was not credited. Some candidates appeared to be unfamiliar with the term 'devise' and used this space to provide an explanation for the reaction.

(ii) Candidates were expected to state that boiling would denature (not kill) the enzyme in the potato. This would result in no or very little foam being produced.

Question 2

(a)(i) A small number of candidates did not answer this part of the question. The most common error was to label a molar as a premolar.

(ii) Only clearly done by the most able candidates. Omitted by a significant number.

(b) This was correctly answered by approximately half of the candidates. It was not always clear to see how the answer related to the teeth labelled in **(a)**.

(c) Candidates who had not indicated missing teeth put themselves at a disadvantage here. The marking allowed for the absence of wisdom teeth but other differences needed to be clearly demonstrated in the diagram in order to be credited.

(d) Candidates were vague in their responses to this part of the question. Examiners were looking for wisdom teeth or some adequate description such as 'back molars' to be missing and a clear reference to the fact that they grow after puberty. Weak responses indicated that Fig. 2.1 represented the teeth of an adult and that he/she was not an adult yet. Similarly, those who had a full complement of teeth stated that they were an adult and so had no teeth missing, which was simply restating the question.

(e)(i) Some excellent diagrams were seen that clearly indicated the visible parts of the teeth, the upper or lower jaw stated, the teeth named and the drawing clear and of reasonable size. While such detail was not specifically required by the question it did make the candidates' answers clear and unambiguous. When candidates failed to name the teeth it was assumed that the first one was the incisor and the second the canine. Some candidates showed the roots of the teeth and it was not always clear which parts of the tooth protruded from the gum. Many were incorrectly drawn/labelled, sometimes (but by no means always) due to the fact that the candidate had named the teeth incorrectly in **(a)(i)**.

(ii) Some good, clear explanations were seen in response to this question. This was, however, balanced by some vague and confused accounts in which statements were contradicted. The key word for candidates to use in relation to incisors is 'cutting' rather than biting or chewing.

(f)(i) The main error here was to fail to give area units, most answers falling within the numerical boundaries set.

(ii) Candidates seemed to focus on chopping up the food into small pieces to increase the surface area rather than breaking the cells or tissues open. Examiners looked for the terms 'grinding' or 'crushing' as it was felt that 'chewing' was an action of the muscles and the teeth in general rather than the specific role of the molars. Weak responses failed to emphasise the large surface area of these teeth or the presence of cusps to assist in the grinding.

Paper 0610/06

Alternative to Practical

General comments

The candidates entered for this Paper showed a wide range of abilities. Many scored high marks and showed a sound knowledge of practical skills with an ability to express their understanding and biological knowledge clearly and concisely. Overall the standard of written English was high and there were comparatively few spelling errors. The drawing skills were well shown and there was an improvement in the standard of the drawings.

The graphical part of **Question 2** was well answered by many candidates involving data from the figure 2.1 and manipulating this using a given formula. Most candidates correctly used a pencil to draw and to construct their bar charts. The number attempting these parts of the Paper using an ink pen or biro is decreasing.

It is important that candidates read carefully through the introduction to the questions and follow the rubric exactly. Some candidates answered using theoretical knowledge in **Question 4** rather than observing the differences between the red and white blood cells in the two photomicrographs.

It appeared that most candidates had sufficient time to complete the Paper.

Comments on specific questions

Question 1

(a)(i) Overall there were many good drawings which had clear outlines and showed accurate detail. Most candidates obeyed the rubric and drew a single tuber and a single flower. Most of the drawings of tubers were larger than the original shown in figure 1.1 but the drawings of flowers were only just larger in many instances. There were a number of flower drawings which incorrectly illustrated a different flower or a vertical section of a generalised flower as seen in many text-books.

Many drawings were not labelled. Only the higher scoring candidates labelled a structure correctly on the tuber but more candidates were able to label one on the flower such as the petal.

(ii) This section was quite well answered. Common errors were pollination, fertilisation, mitosis and meiosis.

(b)(i) All of the starch grains shown were between 11 and 14 mm in length on the printed figure 1.2. Many candidates confused the units and measured in cm. This was acceptable if the decimal point was in the correct place for the calculation. The correct working involved dividing the measurement by the magnification (x 860).

(ii) This part was well answered. A few candidates confused respiration as the metabolic process involved.

(iii) The majority of candidates gained two marks for correctly describing how to test a leaf for starch including safety details using ethanol. This technique is well known. However, the question asked for details of a planned experiment to show the formation of starch in a green plant. This part of the question candidates found more difficult. After placing the plant in the dark or covering a leaf with foil or black paper to destarch the leaf, very few candidates tested a leaf at this stage of the proceedings to show that starch was not present. If this starch test is not carried out before placing the leaf in the light, it is impossible to be certain when the starch is formed. If two similar plants were used one in the dark and one light or a partly covered leaf then candidates might gain the full marks if correct points were described.

Some candidates failed to realise that a leaf tested for starch by boiling in hot water and decolourising with ethanol is unable to metabolise. Others used the incorrect test such as Benedict's.

Question 2

(a)(i) This part of the question was well answered. Some candidates only added the five values to give a total of 5.5.

(ii) Although many candidates gave the correct answer, the reason was not accurate. Instead of pointing out the very high value for test 1, many candidates stated that 1.0 cm^3 result occurred in two tests or that it was the modal value.

(b)(i) The majority of candidates gave the correct volume of the different fruit juices used by reading the values from the levels in the pipettes shown in figure 2.1. Unfortunately some candidates failed to record the accurate volumes e.g. 0.3 cm^3 was recorded as 3 cm^3.

(ii) The formula $\frac{n}{p}$ was given in the text and again in the box in table 2.2, but many candidates did not use the answer from **(a)(ii)** for **n** in the calculation. Some alternative answers received credit.

Candidates were inconsistent when rounding up or down results from 1 or 2 decimal places giving inaccurate results.

(iii) In order to represent the ascorbic acid content of the five fruit juices, the appropriate form should be a bar chart as one of the variables is not numerical. The columns should be made up of narrow blocks of equal width which do not touch.

The types of graphical representation chosen, varied. Some candidates incorrectly drew histograms which are used for frequency graphs with continuous data, others used line graphs trying to plot volume of juice against concentration of vitamin C. Others used column graphs which are used for plotting frequency of numbers using discrete data.

In most graphical presentations the axes were incompletely labelled, frequently missing the unit for the ascorbic acid concentration.

The blocks, whether a bar chart or a histogram was used, were plotted accurately and neatly ruled.

(c) It appeared that many candidates were not familiar with this test. Instead of repeating the test described in the earlier part of the question on samples of fruit juice stored for different periods of time, the candidates carried out pH tests on the acidity of the juice using various indicators such as litmus. Some candidates incorrectly carried out experiments on the storage of ascorbic acid solutions, added ascorbic acid to fruits for storage or stored the fruit to see if it went rotten.

Question 3

(a) Very few candidates gained both marks for shading the surface of the teeth as well as the crevices between the teeth and the gums where plaque is likely to collect.

(b)(i) Well answered, very few candidates incorrectly answered pH 5.1.

(ii) The majority of candidates were familiar with the use of universal indicator or litmus giving the correct colour changes. A few of the candidates who mentioned the use of the universal indicator referred to the use of a colour chart for the result but gave no actual colour change. A few candidates seemed to confuse the determination of pH of the plaque with using disclosing tablets. Other indicators if correct were given credit.

(iii) Although candidates were able to list the characteristics of living organisms many of these candidates were not able to suggest a simple experiment to demonstrate one of these processes using bacteria.

The most common correct suggestions involved respiration, setting up a suitable apparatus to collect and test for carbon dioxide with limewater, using a gas syringe or a manometer with soda lime. This would require an interval of time and it would be necessary to provide some nutrients for the bacteria to metabolise. Growing the bacteria on agar in Petri dishes and observing colonies, counting the increase in number under the microscope were other possible experiments suggested. Movement of bacteria on slides under the normal laboratory type microscopes would be impossible to observe.

Some candidates mentioned the addition of bacteria to milk and proposed to follow the souring or clotting of the milk.

Any possible suggestion was considered and a wide variety was noted.

However, some suggestions were not possible and these involved many waiting for teeth to decay either *in situ* in the mouth or isolated teeth in bacterial cultures. Others referred to the decay of leaves. There was confusion between bacteria and yeast and describing the production of alcohol. Some candidates tried to prove the bacteria were alive by killing them by depriving the bacteria of nutrients or oxygen.

Question 4

(a) Candidates were counting the red and white blood cells. Very few compared these numbers or described how to obtain the ratio by simplifying the numbers. A few candidates measured the sizes of the cells.

(b)(i) Most candidates were able to gain two marks for comparing the number of red cells and the number of white cells between the two figures 4.1 and 4.2.

Only the more able candidate gained the third mark by referring to the greater concentration of the cells or the more variety of types of white cells in figure 4.2. Some candidates failed to refer to the figures and simply described the role of red and white blood cells to the body. Some incorrectly referred to the presence of sickle cells and platelets.

(ii) This section was well answered with reference to disease as an explanation for the observed difference. This was credited whether the cause was nutritionally based as in anaemia, shortage of iron in diet or an infection by a pathogen. Common errors included reference to blood samples from different parts of the body, different blood vessels, oxygenated versus deoxygenated blood.