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# BIOLOGY

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

## General comments

The paper spread the candidates most effectively across the meaningful mark range. Approximately 0.5% scored less than 10, and 0.5% scored 40 out of 40. **Question 33** proved very easy, but otherwise, all questions made a significant contribution to the paper.

## Comments on specific questions

### **Question 5**

It was generally the less able candidates who believed that epidermal cells contain chloroplasts while guard cells do not. The common confusion between guard cells and stomata could well account for this.

### **Question 10**

It is possible that many candidates did not pick-up on the fact that the question was about the effects of exosmosis, but it is equally possible that the regular confusion over the direction of water movement during osmosis was at the root of the problem.

**Question 11**

There appeared to be whole-sale guess-work employed by those who did not appreciate that heating an enzyme to 80°C would destroy it while cooling the enzyme to 0°C would not affect it when it is then used at body temperature.

**Question 14**

That plants continue to respire in the dark was, somewhat surprisingly, missed by well over half the candidates. Even a number of relatively able performers felt that the snail would release more CO<sub>2</sub> than a snail and pondweed, together, in the dark.

**Question 21**

It is likely that confusion between the terms 'constriction' and 'dilation' was the main obstacle in this question – perhaps both in meaning as well as effect when applied to blood vessels near the skin surface. Over a third of candidates opted for responses which included a reference to vessels constricting rather than dilating.

**Question 22**

Almost a third of candidates linked low blood urea with high urea content in the urine. This might suggest that they believe the function of kidneys is to manufacture urea rather than remove it from the blood.

**Question 23**

Confident, able candidates had no difficulty in identifying the sensory neurone. The rest appeared to guess wildly – even opting in surprisingly high numbers, for the hand.

**Question 27**

Candidates found this the most difficult question on the paper. 'Growth' and 'development' are terms in common everyday use, but it was clear that a sound, scientific understanding of them was lacking in well over two thirds of the candidates. The correct definition offered ('an increase in complexity') was taken straight from the syllabus.

**Question 29**

It was surprising that more than half the candidates should believe that there is anything other than a 50/50 chance of a child being either male or female.

**Question 33**

Candidates found this the easiest question on the paper. Nevertheless, it served to indicate that the concept of food chains is thoroughly understood.

**Question 40**

Around 87% of candidates understood that something happens in a uniform fashion to the level of insecticides in the tissues of organisms in a food chain. Perhaps the relatively unfamiliar concept of concentration, expressed in parts per million, led almost as many to believe that the level declines rather than increases.

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

In this examination session there was, once again, considerable evidence, much of it noted in comments about individual questions, of candidates not reading the questions carefully enough. Thus their responses failed to answer the questions set even though what they wrote was often biologically correct. The candidates' responses to some questions revealed a lack of understanding of some fundamental principles and processes as well as very limited familiarity with some aspects of the syllabus that were tested. The bulk of the candidates completed all sections of all questions. It appeared that where sections were left unanswered this was because of a lack of knowledge or understanding in particular topics.

### Comments on specific questions

#### Question 1

A significant number of candidates left part of the table incomplete while many others failed to identify vertebrate groups and suggested that the key identified arthropods, insects, molluscs and worms for example. Of those who only recorded vertebrates in the table there were many who named individual species such as snake, frog, bear etc. and not the group names. A significant number having identified **D** as mammals then considered humans as a separate group and related them to the naked skin feature of **E**. There were others who muddled the features of reptiles (**B**) and amphibians (**E**). A few candidates quoted the scientific names such as Aves, Mammalia etc.

#### Question 2

- (a) Far too frequently candidates did not offer pairs of linked responses that illustrated differences between the two types of nuclear division and simply made a pair of unlinked statements in one of the numbered rows of the table. Candidates displayed confusion between the outcomes of the two types of division, muddling the number of nuclei or cells produced, their genetic state and their uses.
- (b)(i) The term mutation was often confused with the term mutant. The former is a change in the DNA, gene or chromosome and the latter the end effect of such a change. In the case of the latter examples quoted unfortunately tended to reflect the grotesque forms sometimes reported in the media. There were many references to "being born with deformities".
- (ii) Few candidates realised that various forms of radiation and certain chemicals tend to increase the rate at which mutations occur. In the case of the former references to nuclear war and nuclear power were not considered creditworthy unless there was sufficient amplification to show that it was the resultant radiation that was the cause.
- (iii) A significant proportion of candidates were familiar with Downs's syndrome. However others quoted inheritable conditions controlled by recessive alleles, such as cystic fibrosis and sickle cell anaemia rather than being due to an additional chromosome.

#### Question 3

For many candidates this was their strongest response.

- (a) Because of the similarity of the correct responses absolutely correct spelling was vital for credit. **A** was sometimes muddled with the sperm duct.
- (b) Very few candidates realised that the testis is both the site of gamete and testosterone production and so often having placed one label clearly on the testis the other was positioned on the epididymis. It was surprising how many candidates believed that seminal fluid was produced in the bladder.

- (c) Responses to this section were characterised by vague answers such as voice changes and hair grows on the body and did not specify the type of change or where the hair grew. There were a number who did not appear to have realised that the hormone named was testosterone and described changes happening at puberty that occur in females only.
- (d) A large proportion of candidates knew that a vasectomy was performed at some point along the sperm duct but there were some who positioned their label where the urethra crosses the sperm duct, leaving the Examiner to make choice, and there were a significant number who suggested that the urethra should be severed within the penis, making urination impossible.
- (e)(i) This was normally correctly answered by candidates. Those who failed to gain credit usually referred to “contraception”, which was not precise enough.
- (ii) The phrase “other than sexual intercourse” was overlooked by a significant number of candidates. Methods stated should be clearly a mechanism whereby the virus can be transmitted and references to using needles or having injections were considered vague. Sharing needles or using contaminated needles would have been credit worthy. Most realised that blood to blood contact presented the greatest risk.
- (f) Although this was well understood by the majority of candidates many only referred to the urethra in one sex.

#### Question 4

- (a) Candidates should appreciate that chlorophyll is not part of a chemical equation. There were a few candidates who gave equations for aerobic respiration instead of that for photosynthesis. Many were only correct for either the reactants or for the products part of the equation.
- (b) It would seem that many candidates did not read the question carefully as their responses did not deal with “where in a cell” but were about which type of cell photosynthesis occurred in, and thus gained no credit. Candidates would benefit from understanding the difference between chlorophyll and chloroplasts.  
  
Many candidates recognised that the conversion is from light to chemical energy but there were many responses in which one type of energy involved was thought to be heat, kinetic or potential energy. Also candidates who offered solar energy without further information should be made aware that this is not specific enough as solar energy encompasses a wide range of energy forms.
- (c) Although many identified the two chemicals involved as starch and cellulose they were often ascribed to the wrong use. There were many responses that suggested that plant cell walls were formed of protein.
- (d) Many responses tried to describe the movement of a whole range of materials from and to all parts of the plant. Many candidates would have gained more credit if they had focused on the movement indicated. There was also evidence that many do not appreciate the difference in role of the phloem and the xylem. Candidates should appreciate that they should refer to relevant specific materials in responding to this type of question.
- (e)(i) Although the phrase “slash and burn” was explained many ignored this help and described how the increase in cut down materials would add to the carbon dioxide content of the air by decomposition. It was not considered adequate to refer to carbon dioxide as simply carbon. Many candidates dealt with other effects that had no bearing on the carbon cycle such as adding sulphur dioxide to the air, altering the oxygen content of the atmosphere, disrupting the nitrogen cycle, soil erosion etc. in this section, again suggesting insufficient care in reading the question.
- (ii) Most were able to identify at least one effect on the soil. However many of the responses were couched in vague terms such as “the soil becomes poorer” or dealt with the effect of deforestation on food chains and conservation of species, again suggesting insufficient care in reading the question.

**Question 5**

- (a) Although a large proportion recognised the pupil and the iris there were a significant number who identified them the wrong way round or suggested that they represented the lens and other structures in the eye. Candidates were expected to complete Fig. 5.2 with an iris of the same diameter as that in Fig. 5.1 and a larger pupil. A number thought that the pupil would be considerably smaller in dim light.
- (b) It was clear that the majority of candidates were unfamiliar with the structure of the spinal cord in relation to a reflex arc. Very many candidates left the diagram blank or attempted to label it as if it was a diagram of the eye. Of those who had some idea of the reflex arc there were a number who thought that the space between the dorsal and ventral roots was white matter and whose neurone pathways circled around this, never entering the grey matter in the centre. A very small number of candidates gained most or all of the available credit.
- (c) Responses to the interpretation of the graph were poor. Either the question was not read with sufficient care or candidates were unaware of the state of the lens for distant vision as the most common response to (i) was time period **5** rather than period **3**.

**Question 6**

- (a) Candidates had no difficulty in identifying organism **A** as the oxygen producer. Their responses to the other parts of this section of the question revealed very limited understanding or misreading of the question. In the latter case large numbers explained what the two types of pyramids represented in general. When comparing the shape of the two pyramids a large proportion of them commented on the similarities rather than dealing with the request to comment on the differences. Thus comments of the form that both pyramids got narrower from organism **B** upwards were not creditworthy. Those who did take note of this aspect often only described the difference and did not explain it. The difference between organism **A** in the two pyramids was explainable in that this organism was represented by a few very large producers. Some made the sensible suggestion that they might be trees. Responses about the relative numbers of organisms **C** and **D** revealed a basic misunderstanding as the difference was explained in terms of "organism **C** ate organism **D** thus keeping its numbers down". Few referred to the loss of energy at each stage in the food chain or that there must be sufficient numbers of **C** to provide a food supply for **D** as well as having sufficient to breed and produce the replacements.
- (b) A significant number of candidates realised that the normal population constraints applied to the situation described and that the population of organism **E** would be restricted by the finite food supply, competition with **B**, predation by **D** and by disease.
- (c) Again there was evidence of insufficient care in reading the question before responding. Too often the two chemical agents were treated as if they were the same substance and there was confusion regarding which organisms were affected by herbicides and which by insecticides. Few seemed aware of the hazards associated with the overuse of insecticides although some did recognise that they would kill off useful insects such as pollinators and predators of crop pests. Also candidates should be aware of the accumulation in the top carnivore and its possible deleterious effects on such organisms.

**Question 7**

- (a) There was the usual confusion between glycogen and glucagon in responses dealing with the glucose metabolism by the liver. Common misconceptions were that the liver produces insulin and that it is responsible for the digestion of carbohydrates. Unusually a significant number of candidates described the conversion of glucose into glycogen as a "breakdown", a term normally used when chemical compounds are changed into smaller and simpler molecules rather than the reverse. A number of candidates believed that insulin was converted into either glucose or glycogen. The role of the liver in the digestion of fat revealed another misconception that the liver produces the digestive enzyme lipase and thus causes the production of fatty acids and glycerol. Among those who recognised the production of bile as being important there were a significant proportion who believed that bile digests fats or even described emulsification as the production of smaller molecules even fatty acids and glycerol. Very few seemed to understand that emulsification leads to an increased surface area of fat droplets assisting the activity of lipase.

- (b) Only a limited number of candidates seemed to understand that urea is formed from amino acids although those who did identify the source correctly elaborated on this as the amino acids in excess and a few even knew that only the amino part of the amino acid was converted into urea, beyond what was expected of candidates at this level. Very few realised that the filtrate in the kidney initially contains all substances that are in solution in the blood plasma and that the urine only lacks glucose in the list provided. There were candidates who suggested that the urine has no water.

### Question 8

- (a) Although most had an understanding of diffusion there were some rather vague responses. Candidates should be aware that diffusion involves small particles, at the molecular level. The concept of a concentration gradient appeared to be misunderstood as there were many references such as “from a high concentration gradient to a low one”. This suggested that a concentration gradient was not a difference in concentration between two points but was actually the two points. Some responses revealed confusion with osmosis as there were references to the role of various membranes ranging from the fully permeable to those that are impermeable.
- (b) The data was on the whole plotted clearly and accurately. However, the points should be connected either with straight lines from point to point or by a line of best fit. In the latter this line should pass through some of the points and have others just above or below it. In some cases the line touched only a single plot and all the others were to one side of it and this was clearly not a line of best fit. The labelling of the printed lines should have indicated that this is a requirement for the plotted data as well. Most candidates responded correctly to the sections dealing with the cause of the change in colour of the litmus paper and the sample that travelled slowest, although there were significant numbers who thought that the change from red to blue was because ammonium hydroxide was acidic. Many candidates recognised that the concentration of sample **C** was between that of samples **A** and **B** but phrased their responses in a vague manner and referred to it being “an average or mean”. Of those who made their responses comparative many were confused as to which of **A** and **B** was the most concentrated. It seemed to be assumed that the steeper slope represented the more concentrated sample. Even fewer explained their suggestion when a simple comparison of the speed of diffusion would have sufficed.
- (c) Very few candidates were able to apply their knowledge that the blood arriving at the alveolus, at **Z**, would have a higher concentration of carbon dioxide than that moving away from it, at **X**, and thus the highest rate of diffusion would be at **Z**. Candidates should be aware that it is the mucus that traps dust particles and bacterial spores in the air and that the role of the cilia is to sweep the mucus away from the finer lung airways. Far too many gave the impression that the cilia knock the dust particles back along the airways rather like baseball bats.

**Paper 0610/03**

**Paper 3 (Extended)**

### General comments

All of the questions and the paper as a whole achieved very good differentiation between candidates. The replacement of **Section B** with further structured questions has certainly proved to be an improvement. It appears to help candidates to focus their answers better and, in general, perform rather better.

Answers were usually succinct and there was little evidence that time was a problem in completing the paper. There were few blank spaces left, so candidates of all abilities were able to write something in response to each question. Most Centres showed a good spread of marks.

There was little to go wrong in keeping to the rubric and little did. Problems encountered by candidates tended to be through lack of specificity in applying terminology rather than a lack of subject knowledge. Many candidates still have difficulty distinguishing between questions that ask for comparative answers, such as in **Question 2 (c)** and **Question 5 (c)** and those that ask for absolutes.

One very good practice now appearing more and more is the underlining or highlighting of key words in questions, enabling candidates to keep their answers to what the question has asked. Candidates doing this rarely answer inappropriately.

From a social point of view it is to be celebrated that large numbers of young people are now aware of behaviours that can put them in danger of HIV and those which can protect them from the virus.

### **Comments on specific questions**

#### **Question 1**

The content of this question was understood well by most candidates.

- (a)(i) Most had no difficulty identifying the cells as plant and animal although a few answers only identified one animal and one plant cell.
- (ii) The correct answers were cell wall and vacuole. Marks were dropped by candidates naming chloroplasts as these are not found in all plant cells.
- (b) Some very good answers were marked, containing very accurate details. Cell **A** was the cell whose features and function were stated correctly most often. Fewer candidates could state a feature of the muscle cell, **B**, although most gave its function correctly. There was often difficulty stating a feature of the ciliated cell, **C**. The term cilia was not well known and often misspelt. Many stated that its function is to trap bacteria, dust or mucus, rather than to move these away from the lungs. It is possible that some confused cilia in the respiratory tract with hairs in the nose. It is the mucus which traps dust: the cilia serve to move the mucus and dust. Descriptions of a feature of cell **D** were often poor, with references to the presence of a tail being too common. Some stated the presence of a vacuole, but this did not distinguish it from cell **A**. Functions were usually correct, although some gave transport rather than absorption.

#### **Question 2**

The question was usually answered very well, with part (c)(iii) proving to be the most difficult on which to gain full marks.

- (a) The table was completed accurately by nearly all candidates. Occasionally, candidates incorrectly responded 'none' for sugar and sweets. This answer was not in the terms stated in the question and was not comparative.
- (b)(i) Cereals, vegetable and fruit, and sugars and sweets were all acceptable answers for food groups containing a good source of carbohydrates.
- (ii) Meat, eggs, fish and dairy products were usually given and accepted. Those who selected sugars, sweets were also awarded a mark because sweets such as toffees and chocolate contain appreciable amounts of fats.
- (c) Marks were sometimes lost because candidates failed to make comparisons between the European and African diets.
  - (i) To gain the mark, it was necessary to state that the African girl's diet contained less protein due to a smaller amount of meat, eggs and fish, or dairy products, in her diet. Some suggested that she would have less calcium due to less dairy products and this was also accepted.
  - (ii) Most correctly identified that the European girl had less vegetables and fruit in her diet. Fewer gained a second mark for suggesting that these are a possible source of vitamin C.
  - (iii) Two marks were often awarded, for references to the European girl having less cereals, vegetable or fruit in her diet, resulting in less fibre. However, there was general difficulty describing the role of fibre: references to peristalsis or an accurate description of it were surprisingly rare. Vague remarks about fibre cleaning out the alimentary canal or making it easier for food to pass were common. Very few were aware of the role of fibre in reducing the risk of colon cancer.



**Question 3**

Candidates found this question to be more challenging.

- (a)(i) Few candidates were able to complete the diagram successfully or indicate the direction of blood flow. When drawings of capillaries were attempted, they were sometimes shown as a single line and rarely linked the artery with the vein.
- (ii) The liver was usually named correctly.
- (b)(i) The most common correct answers included carbon dioxide, glucose and amino acids. Incorrect answers were most often 'urea' or 'deoxygenated blood'.
- (ii) Oxygen was the only acceptable answer and this was usually stated correctly.
- (c) Too many candidates did not read the question carefully enough and stated features of the villus rather than the cells in the surface layer. Few candidates are aware of the presence of microvilli, but a reasonable proportion correctly stated that the cells have a large surface area and that they form a thin, or single, layer.
- (d)(i) The name lacteal was not always known.
- (ii) References to the absorption of fatty acids and glycerol gained two marks. There was the occasional misconception that fat digestion takes place in the lacteal.
- (e) Acceptable answers included details about the presence and role of lymph nodes, return of tissue fluid to the blood stream and the role of lymphocytes in producing antibodies to destroy bacteria. Sometimes answers were too vague, with the type of white blood cells being formed by lymph nodes and their role in fighting disease not being clearly stated. It was apparent that some candidates were trying to get the Examiner to select the correct answers from ambiguous sentences. Confusion between lymphocytes and phagocytes was common. Other candidates failed to follow the rubric of the question and repeated details of absorption already give in **(d)(ii)**.

**Question 4**

The question covered a number of sections of the syllabus. Knowledge of these varied substantially.

- (a) The question asked for an explanation rather than a description. So, to gain marks, candidates needed to go further than copy statements from the text. Answers frequently described mosquitoes feeding on the blood of birds without involving any infection (either of the bird or mosquito).
- (b) Most candidates were aware that viruses need cells in which to replicate their nucleic acid. Other acceptable answers included a suitable temperature and the presence of water. Unfortunately, many biologically incorrect responses were common, such as viruses needing food or oxygen. Examiners questioned whether candidates were aware of the difference between the terms food and nutrients. Use of red blood cells was not accepted: candidates should have been aware that these cells have no nucleus and therefore no DNA for the virus to use.
- (c) Nearly all answers were correct.
- (d) The quality of answers was varied. Too often details were confused or biologically incorrect: many thought that insecticides kill plants, damage the ozone layer or result in global warming. Similarly, pesticides were confused with fertilisers, with details given about eutrophication. Inadequate terms such as *affects* and *harms* were common when describing the effects of pesticides on other organisms or the environment.
- (e) Generally, insect features were stated instead of features of *all* arthropods. Surprisingly few candidates could give two features correctly.
- (f) Most were aware of the terms genus and species, but fewer linked these to the name of the mosquito (*Culex pipiens*) given in the text. Occasionally, candidates tried to use all the classificatory terms from kingdom downwards. The terms gene and genus were inevitably mixed up by some candidates. When misused terms have another biological meaning, Examiners cannot give the benefit of the doubt to the candidate.

**Question 5**

This proved to be a more challenging question than expected, with few candidates gaining very high marks: the role of auxin in plant roots was not well understood.

- (a)(i) Two marks were available here, but many candidates overlooked this and stated geotropism without qualification. Descriptions were sometimes given instead of a name. A common spelling error was geotrophism. This needs to be discouraged since *trophic* has an entirely different meaning.
- (ii) Many candidates failed to explain any mechanism, merely stating that roots grow towards gravity. References to auxin were not common and the mechanism was either not known at all, or confused (with statements about auxin accelerating the growth of the radicle often written). However, the best candidates gave detailed and accurate explanations.
- (iii) Correct answers included references to anchorage and absorption of water and minerals. However, there were also many vague responses relating to growing downwards into soil. Some candidates unnecessarily penalised themselves by putting 'the absorption of water and minerals' as one point on the same line, then giving an inadequate response on the second line.
- (b)(i) With few exceptions candidates recognised the control, or that a comparison was being made. Brave attempts were made to explain how the turning would eliminate the effect of gravity.
- (ii) Some, but not all, candidates recognised that light would be another variable. Weaker candidates thought that this was an experiment about the factors necessary for germination.
- (c) Candidates who understood etiolation were rare. It was certainly apparent that few had seen plants that had been kept in the dark, although this is a relatively easy experiment to carry out. Nearly all candidates thought that plumules in the light would grow faster and taller than those in the dark. Responses in the form of comparisons were needed here but, again, these were often absent in answers.

**Question 6**

- (a) Candidates usually gained at least one mark, with a reference to excretion or nutrition. Not all candidates had read the question carefully enough, often stating a characteristic of life that would not be observable, such as respiration (confused with breathing), growth and reproduction (unless it was qualified to a reference to a process such as egg-laying or mating with another lizard). Some even stated movement, despite clear instruction in the question, or gave features of animals such as legs.
- (b) Most candidates were able to describe the relationship between external temperature and the lizard's body temperature.
- (c) There were some very good answers here, but the usual misconceptions were common. In particular, too many answers referred to the constriction of capillaries or veins or their movement away from the skin surface. The incorrect idea that body hairs become erect to trap a layer of heat (rather than air) was quite frequently written. Some answers referred to features that are permanently present in mammals, such as fat or body hair for insulation. These are not mechanisms that are used in response to short-term changes in external conditions. Very rarely did candidates recognise that the heat from shivering came from respiration in the muscles. Some candidates wrote everything they knew about homeostasis in both sections, instead of focusing one aspect in each part.
- (d) Better candidates gave good answers here but weaker candidates struggled, unable to make a link between a drop in external temperature and its effect on the process of energy release for movement. Weak answers usually suggested that the lizard would move more slowly to conserve energy, or that the low external temperature would 'freeze up' muscles and joints.

**Question 7**

Nearly all candidates were able to attempt all sections of this question.

- (a)(i) No problems were encountered, except that a small number only identified one country, or tried to name countries.
- (ii) This was generally answered well. Sometimes, answers were too vague, such as 'improved technology' and 'improved standard of living'.
- (b) This was well answered. A few opted for country **F**, apparently looking at its life expectancy without considering the change between 1982 and 1999.
- (c)(i) A simple statement that HIV is a virus and antibiotics are only effective against bacteria was what was expected here. However, there was much confusion between antibiotics and antibodies, with detailed statements about the changing shape and composition of the virus. Some thought that, although HIV cannot be controlled by antibiotics, other viruses can, or stated that antibiotics are not strong enough to kill viruses.
- (ii) Answers were usually good. Occasionally, the diaphragm was named as the type of contraception, or the prevention of transfer of sperm (rather than the retention of body fluid) was given as an explanation.
- (iii) Candidates need to refer to an infected person as their starting point to their answer to this question: HIV will not be transmitted by any method unless the virus is present. However, the topic is widely known and understood. However, coughing, kissing and sneezing are very unlikely ways of HIV being transmitted.

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

Several new Centres entered their candidates for Paper 4 this year. Most chose appropriate tasks and wrote suitable mark schemes, which allowed them to assess their candidates for the correct skills and at an appropriate standard.

Some problems did arise, however, for some Centres. Perhaps the most difficult for the External Moderator to cope with is when insufficient care has been taken within the Centre to ensure that internal moderation has taken place effectively. If two teachers each go their own way with their assessment of candidates for coursework, it is extremely difficult for the External Moderator to bring their marks into line with each other and with those of other Centres.

Internal moderation must begin well before any candidates are assessed. It should involve all teachers in constructing tasks and mark schemes, so that each one has been carefully considered by each teacher. Teachers can then choose tasks from this 'bank' as they wish; they do not necessarily all need to use exactly the same set of tasks, although it does help considerably if they do. Where they do use the same task, the work sheet and mark scheme should be identical, and samples of work from each teaching group should be cross-checked as a central part of the internal moderation procedure.

A few Centres appear to provide their candidates with only the minimum number of assessment opportunities, so that they cannot 'discard' their weaker performances. When teachers have run the assessment for a few years, they could consider using tasks in which two or three skills can be assessed.

There are still some instances of inappropriate tasks being set, although these are becoming increasingly rare. They often involve paper-and-pencil exercises, which are not suitable as they do not involve practical work done by, or seen by, the candidate. Another difficulty is tasks set for Skill 4 which do not provide the candidate with the opportunity to identify and control variables. Food test investigations, for example, are almost never appropriate tasks to use for the assessment of planning skills.

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

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

It appeared that some Centres supplied an individual leaflet as specimen **W2**, although most of the errors observed seemed to be on the part of the candidates. The fact that Centres supplied information concerning the specimens was useful to the Examiners, as was the inclusion of pictures or photocopies of the specimens that were used. Centres are encouraged to supply as much information as possible so that Examiners can understand any observations that may appear to be unusual.

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

- (a)(i)** Most candidates recognised that the exposed surface had changed to a darker colour than the unexposed surface. Some had obviously reversed the observations as the freshly cut surfaces were correctly recorded as pale in **(a)(iii)**.
- (ii)** Most candidates managed to record appropriate colours and pH values given were usually within an acceptable range. Some candidates misunderstood and simply stated that the solutions were acidic or alkaline. A specific pH value was required.
- (iii)** Most tables were drawn using rulers and contained the required information. Supervisors' reports were of particular assistance with this question, as speed of colour change varied with climate and, in some cases, material was substituted.
- (iv)** Candidates were expected to combine the information gathered so far and to refer to 'acidic', 'alkaline' or specific pH values rather than 'A1' or 'B1'. More able candidates were able to make sensible statements.
- (v)** This part of the question was not answered well. Candidates were expected to suggest a suitable oxygen-free environment and to have a similar piece of tissue exposed to oxygen as a control. Further marks were available for exposing the same surface area of tissue in each case, conducting the experiment with the tissue at a suitable pH (so that colour change would in fact take place if all other conditions were favourable) and the idea of repeating the experiment in order to obtain valid results. Many candidates simply suggested what would happen in the presence or absence of oxygen and only the most able scored significant marks for this section. Unless specifically requested, candidates should not rely on providing results to gain marks when an investigation or method has been asked for.
- (b)(i)** The starch/iodine test was generally well done and recorded.
- (ii)** More difficulty was experienced with the biuret test. Here, again, Supervisors' results and comments were most useful. Some candidates were not aware that this was a test for protein, while others tried to deduce some kind of semi-quantitative conclusion.
- (iii)** Most candidates could correctly describe the test and expected result.

**Question 2**

- (a)(i) Clear, large diagrams were drawn by a large number of candidates. Some sketching of the outline was seen. Candidates should be encouraged to use a single line. A minority of candidates drew a single leaflet. Labelling was of variable quality and accuracy. Candidates should ensure that the label line actually touches the area/structure/feature that is being labelled. Some candidates failed to label any structures at all – although whether this was because they were unable to do so or whether they forgot to do so, is not clear. It is a good idea for candidates to ensure that they answer a question completely before moving onto the next – this will involve re-reading the question, something that many of them seem reluctant to do.
- (ii) This was well answered by most candidates. Some did not state the reason for choosing 'dicotyledon' clearly while others chose 'monocotyledon' and did not score.
- (b)(i) This was a good discriminating question, the most common error being the lack of clear or correct demarcation between the cell layers. Candidates were expected to distinguish between the upper and lower epidermis. Examiners were looking for clear indication that chloroplasts occurred in the palisade and spongy mesophyll layers (and in the guard cells). Those who indicated that they were to be found in the upper epidermis were not awarded the mark.
- (ii) Those candidates who labelled the air space experienced less difficulty than those who attempted to label guard cells or stomata, due to the nature of the photomicrograph. It was clear, however, that some confusion exists between the nature of the guard cell and the stoma. In the minds of some candidates they appear to be interchangeable terms.
- (iii) This was generally well answered, particularly by the more able candidates. Some errors in measurement were evident, the thickness of the leaf being its vertical height, not the width of the photograph. Candidates should check the validity of an answer, particularly in relation to units. The candidate who gave an answer of 1.7 m had clearly not done so.

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

The candidates entered for this paper showed a wide range of abilities and the mark range covered 36 to 0. Many candidates 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 in **Question 4**. Planning investigations to show the effect of pH on the browning oxidase enzymes in apples was more difficult for candidates though the ideas shown were often based on a sound biological knowledge.

Most candidates correctly used a pencil to draw and to construct the column graphs in this examination session. The number attempting these parts of the paper using an ink pen or biro is decreasing. Mathematical skills were not always strong when dealing with magnification in **Question 1** – units were confused and in **Question 2** dealing with the column graphs.

Candidates often failed to read the instructions carefully especially in **Question 4** which asked for a labelled drawing and the labels were omitted by many candidates.

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

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

This question covered points on classification of nematodes and annelids both groups are mentioned on the 2004 syllabus. The question tested the candidates' observation and mathematical skills on magnification.

- (a)(i)** A nematode was illustrated in Fig. 1.1 and candidates were required to measure the length of this worm. There was a scale line to show the magnification of the drawing. Many candidates assumed the scale bar was 0.1 mm and not 15 mm and so divided the overall measurement of the nematode by 0.1 instead of 15 or if measured in cm 1.5.

There were many candidates who were able to correctly calculate the length of the nematode as approximately 1.0 mm. These candidates were showing good mathematical and knowledge skills. Many candidates were confusing or not quoting the units of measurement which were used.

If the answer given was incorrect then the method of working was checked carefully for the working mark. It is important that candidates always show the working and not just record the answer.

- (ii)** The earthworm in Fig. 1.2 was drawn to a different scale, the scale bar showing 2.0 cm. The candidates' mathematical skills were tested but in a different manner. The candidate had to measure the length of the earthworm and then calculate the number of times larger this worm was compared with the nematode. Again confusion between units mm and cm was noted as the scale bars were 0.1 mm and 2.0 cm.

Some candidates calculated the correct answer but those who did not were often able to gain the working mark for dividing the length of worm B – earthworm by the length of worm A – nematode.

- (b)(i)** In the printed table candidates were asked to complete the spaces for two differences and one similar feature for the two worms. The table was intended to guide candidates to compare 'like' features and there were fewer non-matching features compared than had been noted in previous papers.

The most common features to be compared were the transparency of the body wall to show the intestines or not and the segmentation of the body of the annelid (some candidates used the term metamerism). Some candidates referred to chaetae though if these were referred to as bristles or 'hairs' in the correct context these alternatives were accepted but not legs. Some candidates referred to the saddle or clitellum.

A simple reference to the common shape of the body was accepted as a similarity but only the more able candidates gained this mark. The majority of incorrect answers were based on negative features, describing those features not present or simply stating they were both invertebrates or worms which crawled.

- (ii)** The groups for the two worms are in the syllabus as nematode and annelid. The answers varied but many candidates had no idea of the groups. Many candidates gave common names and often these were reversed so that worm A was called an earthworm or annelid but others incorrectly referred to other invertebrate groups such as molluscs or even to a vertebrate.

**Question 2**

This question was based on mathematical skills of data handling in the construction of a tally chart and the presentation of this data as a column graph. Part **(b)** was based on observations based on the interpretation of the column graph.

- (a)** The tally chart was completed well with most candidates showing the vertical strokes in sets of five. There are still a small number of candidates who still count in multiples of four or not using a diagonal bar and some which just give vertical bars. Some candidates just give the number in roman numerals without a tally chart. The scoring was fairly accurate.

- (b) The question requested a column graph and according to the terminology section in the syllabus this form of plotting is used for plotting frequency graphs for discrete data. The graph should be made up of narrow blocks of equal width that do not touch. Only a very small number of candidates correctly drew columns not touching. Those candidates correctly drawing column graphs showed the columns touching. A large number of candidates drew line graphs.

**A-axes** – Most graphs had the axes labelled fully with the x-axis representing the number of spots as correctly orientated.

**S scaling** – The scales selected varied widely. On the y-axis the able candidates not only selected a suitable scale to fit the graph but also one to make maximum use of the printed grid. (1 mm square equalling 0.25 or 0.3.) It is not appropriate to start the y-axis at anything but 0 for a column graph nor to extend the axis by drawing another extra block to accommodate the 11th leaflet. Numbers on the x-axis should be placed centrally under the columns not to one side. Only a very few candidates incorrectly constructed two graphs side by side using a common y-axis.

**P plot** – Overall the points were plotted accurately with few errors.

**L line** – The columns need to be ruled, of equal width and not touching. This was well presented by candidates from a few Centres but in most cases unfortunately the columns touched.

**K key** – Most graphs included a key either at the side of the printed grid or by each column. The shading of the column blocks was easy to follow but at times rather untidy.

- (b) Despite being given quite a lot of information about the numbers of leaflets and spots in the polluted and non polluted areas, most candidates only gained 1 of the 2 available marks. Candidates should always take note of the available marks for each question and try to give an appropriate number of points in their answer.

The most common comment was that as pollution increased the black spot infections decreased. More able candidates commented that there were more leaves with no spots in the polluted areas and quoted the figures 11 to 4. Some candidates commented on the size of the spots.

It is important for the answers to compare leaves from the two areas as one sided comments such as leaflets from polluted areas have a low number of spots', without reference to numbers or a comment about those in the non polluted areas this statement was not sufficient.

A common error among the less able candidates was to ignore the actual results and to assume that the pollution would increase the number of spots. Such answers often continued to describe the effects of pollution like sulphur dioxide preventing photosynthesis or a reduction in chlorophyll or the prevention of light reaching the cells.

Another error, from those candidates who had drawn line graphs, was to describe the increases and decreases in the number of leaflets as the number of spots varied but this failed to answer the question.

### Question 3

This question was based on the enzymes that result in the discoloration of fruit when exposed to oxygen in the air. In part (a) a simple procedure was outlined and in part (b) the candidates were tested on the planning skills (C4) to devise a similar experiment but on varying pH.

- (a) The points required for the evidence for the colour change in the untreated and the two differently treated apples (boiled and affected by acid lemon juice) were all contained in the introductory paragraph. The explanation points involved linking these points with the role of enzymes and the fact that the enzyme failed to bring about a colour change if exposed to high temperatures which denatured the enzyme or if exposed to a low pH.

The majority of candidates ignored the two headings and wrote their answers using all of the lines and often continued below part (b). Quite a number of candidates were able to gain the evidence points by repeating the relevant points from the introduction. Those candidates who referred to the involvement of enzymes were able to score quite highly as the link between the effect of acid and boiling with denaturation of enzymes was well known. There are still a small, though decreasing number of candidates referring to the 'killing' of enzymes. Able candidates linked the enzyme activity to the oxygen.

Common errors were to involve bacteria and rotting of the apple to cause the brown colour to develop. Others stated that starch reacted with air and turned brown, often linking this with the addition of iodine solution.

The full range of possible answers were seen covering all marking points allowing able candidates to gain maximum marks.

- (b)** It is clear that some candidates cover the basic principles of planning experiments carefully and thoroughly as it was possible for some to score full marks for this section. All factors need to be controlled except for the one under investigation, in this instance pH.

The points commonly gained were for the use of at least three different pH, (usually an acid, an alkali and neutral solution such as water) and comparing the colours formed after the same time interval for each sample of apple. Often it was the same apple which was cut into equal sized pieces for testing. More able candidates described how the pH solution was to be obtained but only a few mentioned the need to control temperature or to keep volumes of solutions the same. Repetition of the procedure was not often encountered in the answers. Handling of the information and displaying results was seldom seen.

Less able candidates tended to repeat the first part of the question and measured the pH of the apple not varying the treatment with different samples of apple.

#### Question 4

- (a)(i)** Despite Fig. 4.1 showing clearly in the photograph the structure of a pinnate leaf, in this case a rose leaf, many candidates did not perform well on this drawing part. There were many candidates who failed to read the instructions and drew the outline of the whole leaf instead of the bottom two leaflets and the leaf base with the stipules. Others drew just one leaflet. Many drew stylised leaves bearing no resemblance to that of Fig. 4.1.

In the drawings, it was the accuracy and proportions of the leaflets in relation to the thickness of the rachis and stipules that was unsatisfactory. The stipules were often omitted and details included which were not obvious on the photograph. Other candidates thought that the stipules were floral parts. The outlines of the drawing were often sketchy, artistic instead of a clear steady line. The number of veins was not accurately represented.

The instructions required a labelled drawing but many candidates failed to label a single structure.

- (ii)** To select two features of the leaf to show it was a dicotyledon was quite straightforward and most candidates were able to do so choosing the broad leaflets and the presence of a midrib or a network of veins. Some candidates failed to read the question carefully and included reference to features not shown on the photograph.
- (b)(i)** Fig. 4.2 showed a scanning electronmicrograph of a section through a leaf and candidates were required to identify and to label the various regions. The use of brackets to one side of the figure was the easiest manner to label these. Many candidates confused epidermis with epithelium, palisade mesophyll and spongy mesophyll. Others identified stomata though there were none present on this section.
- (ii)** Able candidates were able to annotate the palisade mesophyll and the spongy mesophyll as the two types of cells to contain chlorophyll. These had to be labelled X and Y and both had to be correct for the mark. Unfortunately, many candidates were able to label one but not the second for labelling a non existent guard cell, an epidermal cell or an air space in the spongy mesophyll layer.