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BIOLOGY

Paper 0610/01
Multiple Choice

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

General comments

The paper proved a little less challenging than in past years with over half the candidates correctly answering all but one of the questions. Over 90% of candidates were successful with six of the questions, but, of these, only one failed to identify candidates at the bottom of the ability range.

Comments on individual questions

Question 4

Even the weaker candidates who might just have struggled with a dichotomous key were able to recognise that the mammal illustrated had a curly tail, and thus opted for the correct answer.

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Question 8

There was some evidence here that a few of the better candidates opted for the answer that would indicate that carbon dioxide is not always released by living things during respiration. The question would certainly have been more reliable if it had referred to *aerobic* respiration. It should be acknowledged that not all forms of anaerobic respiration release carbon dioxide, but the respiration of all organisms with which candidates would have been expected to be familiar does, indeed, release that gas.

Question 13

This was the only question which failed to discriminate between candidates of differing abilities. Almost a fifth, including a significant number of the more able, appeared either to confuse the position of the pancreas with that of the gall bladder, or to believe that the pancreas is responsible for the process of emulsification.

Question 14

Statistically, this question was outstandingly successful. It is thus of singular significance to note that the weaker 20% of the candidates appeared to believe, perhaps surprisingly, that vitamin D is needed for oxygen carriage in the blood.

Question 17

Although a high percentage were successful with this question, the belief that water both enters and leaves a plant as vapour did attract a few candidates who, otherwise, performed modestly well on the paper.

Question 25

This question required some care to follow the data, but, to their credit, a large enough percentage did so to make this one of the easiest questions on the paper.

Question 32

This question demonstrated that candidates have a sound grasp of simple food chains and the terminology employed relating to them.

Question 33

The most difficult question on the paper, it revealed a serious misconception. One third of the candidates offered options which suggested that they believe that photosynthesis is a process involving energy loss between trophic levels.

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BIOLOGY

Paper 0610/02

Core Theory

General comments

The majority of candidates answered all questions, although, as in previous years, there were a significant number of candidates who did not attempt all parts of all questions. However, this did not appear to be linked to insufficient time to complete the paper but rather to inadequate preparation for the demands of the questions. There were some candidates who showed very limited knowledge and understanding of some topics from the syllabus and it seemed that most candidates found at least some parts of the paper demanding. Responses to various sections of questions revealed again this year certain misconceptions and misunderstandings. Questions in which candidates were asked to make predictions were answered with greater skill this year. However there was evidence in a number of places, indicated in the comments on specific questions, that candidates had not read the questions carefully or thoroughly enough and thus their responses were inadequate or off the point. Candidates should be made aware of the need to read the questions carefully and to take note of each question's demands.

Comments on specific questions

Question 1

Although the majority of candidates responded with characteristics of living things and noted the restriction in the question there were a small number who quoted features mainly restricted to animals and not characteristics of the wide range of living organisms. Examples were locomotion or moving from place to place instead of movement, digestion or ingestion instead of nutrition and egestion, and urination instead of excretion. In few isolated cases candidates ignored the request for characteristics of living organisms and instead listed animal groups such as mammals and birds. In **(b)** large numbers of candidates revealed misunderstandings and confusion about the difference between breathing (the movement of air in and out of the lungs) and respiration (the release of energy from substances such as glucose). Breathing was often muddled with gaseous exchange. Some mistakenly thought that only oxygen was breathed in and only carbon dioxide was breathed out. Many clearly thought that respiration produced or created energy, a scientific impossibility.

Question 2

Candidates seemed to have limited familiarity with the features of wind-pollinated flowers. Very many did not appreciate that their petals tend to be small and dull in colour nor that the pollen tends to be light and dry. A majority thought that these flowers had long sepals rather than the stamens or the style.

Question 3

It was clear that many candidates were familiar with digestion and could identify the missing food material, the enzymes involved and the end products of digestion. The weakest responses were those that named just one end product of the digestion of fat rather than both glycerol and fatty acids.

In **(b)** candidates' responses were very weak and lacked biological detail. A lack of careful reading of the question seemed to play a major part in the poor responses. Although many realised that the ultimate fate of excess amino acids is their removal from the body via the kidney, it was rare for a candidate to link this to the question that referred to "processes occurring in the liver". Thus only very occasional references were made to deamination and the formation of urea. Many knew that glucose was stored but yet again few linked this to the question and instead discussed its conversion to fat and subsequent storage in the skin. A common misunderstanding was that excess amino acids are stored in the body.

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Question 4

There were a significant number of candidates who mistakenly considered light to be a raw material in the process of photosynthesis and also many candidates who clearly muddled the roles of carbon dioxide and oxygen as a raw material or a product of photosynthesis. In **(b)** many candidates seemed to think that Benedict's reagent can be used to test for the presence of starch. Also the responses in the table revealed little familiarity with the test for starch in the leaves of plants in which the boiling in ethanol removes all, or at least the bulk of, the chlorophyll thus enabling the end colour of the test to be seen. Many responses seemed to just indicate whether chlorophyll was present or absent, while others overlooked the fact that in the absence of starch the leaf would become the same colour as the iodine solution, basically brown. However even those who did give logical and correct responses often failed to correctly explain these for areas **B** and **D**, the absence of chlorophyll at **B** and light at **D** being critical.

Question 5

In this question, there was often confusion between the right and left sides of the heart. The greater thickness of the wall of the left ventricle was thought to give sufficient guidance to the candidates. Thus labelling was often partly reversed. However this does not explain the muddling of the atria and the ventricles. Although the question requested the shading of the blood vessels carrying deoxygenated blood candidates were not penalised for also shading the relevant atrium and ventricle as well. However some only shaded these chambers and ignored the blood vessels entirely while others shaded blood vessels on both the right and left sides of the heart. The request for a series of arrows normally produced such an addition to the diagram but in some cases on the wrong side of the heart. Also the point of entry and exit from the heart were often reversed. However there were many responses in which the series of arrows went through the wall between the two ventricles, revealing a major misconception as to how the heart operates.

Question 6

There were many misidentifications of both **R** and **S** with the latter, often named as the uterus or cervix when the label line was carefully placed well away from either structure. Candidates also had little understanding where either fertilisation or implantation occurs in normal circumstances and also seemed confused with the site of deposition of sperm during intercourse. Wide latitude was given for the spelling of oestrogen but no credit was given when the response was clearly a mix of this term with progesterone. There were candidates who gave testosterone as the relevant hormone in females. Was this a misunderstanding or a lack of careful reading of the question?

In **(c)** there was evidence again of careless reading of the question which ruled out references to parts of the body shown in the diagram and often responses referred to the ovaries or the uterus. Candidates should be specific and careful of spelling when referring to the development of hair - they should be made aware that pubic hair and public hair are not the same thing.

Question 7

The majority of candidates correctly identified the allele for NPS as being recessive. The evidence for this occurs from the fact that parents **6** and **7** do not show the condition but one of their children does and is thus homozygous recessive. Therefore both parents must have the allele but it is not expressed, hence it is recessive. Some candidates incorrectly based their reasoning on the relative frequency of occurrence of the condition.

In **(b)** many candidates worked out that there was a 1 in 4 chance that any child of parents **6** and **7** could have the condition but then contradicted their argument by stating that since **8** already had it, a third child could not. They must appreciate that each and every fertilisation is random and it would be possible for the third and any subsequent children to have the condition.

Question 8

It was expected that candidates would recognise that the bacterial population rose after the addition of raw sewage and that downstream of this point it fell again to its original level. However, candidates were expected to explain these changes in **(b)**, not in **(a)**, and this was tackled with varying degrees of success. Many recognised that untreated sewage has bacteria within it, that this would give rise to a population increase and that the organic material in this sewage would provide nutrition and a subsequent further rise in numbers. Later these materials could be used up and this could account for the fall in the population. Some linked the raw sewage to eutrophication, a feature more commonly related to the high nitrate levels of treated

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sewage than untreated sewage. Logical responses based around this idea were also credited equally, however simple references to eutrophication with no explanation as to how this affected the bacterial population gained little or no credit.

Question 9

Many candidates identified the top carnivore, the killer whale, and the organism that is both a secondary and a tertiary consumer, the Adelie penguin. Greater numbers completed a relevant food chain but there were a few who omitted the krill from their chains, when it is the only organism in the food web that consumes the algae.

In **(c)** most candidates recognised that the Ross seal population was likely to decrease ad thus reduce the food available for the leopard seal, or increase its reliance on the Adelie penguin and hence lead to a fall in the seal's population. Additionally, many candidates were able to relate the loss of Ross seals to a change in the fish population. There were four alternative approaches that led to logical responses that could either cause a rise or a fall in the fish population and equal credit was given to all of them. Although some approaches were more commonly seen in responses than others, all gained full credit.

Question 10

A definition of homeostasis should be a general statement that covers all situations where it occurs and not simply be about one homeostatic mechanism. Those who did relate their definition to a single mechanism then became rather muddled when they tried to relate this to the eye's iris reflex, especially when their original mechanism was about maintaining a constant body temperature. Descriptions of the iris reflex were poor and muddled, with the inevitable confusion between the iris and the pupil. There was also some confusion between the action of the iris muscles and the ciliary muscles. Candidates should realise that the iris-pupil mechanism does not control the amount of light entering the eye, since it has already entered by the time it reaches the pupil. It does, however, control the amount of light reaching the retina. In addition, it is not simply a protective mechanism against too much light getting to the retina but ensures that a constant level of light reaches it.

Question 11

The commonest error was to muddle the renal vein with the vena cava. There was confusion between the ureter and the urethra and responses that could have been intended for either.

This is a case where accurate spelling is essential. In **(b)** the majority of explanations were simply a repeat of the data in the table, sometimes quoting actual values and more frequently a general summary. Very few recognised that the decrease of both the oxygen and glucose from the renal artery to the renal vein was related to the cells of the kidney carrying out respiration and requiring quantities of both these materials. The other differences were related to the filtering of blood plasma and the subsequent partial reabsorption of water and mineral salts such as sodium salts but not urea.

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Location Entry Codes

UNIVERSITY of CAMBRIDGE
International Examinations

As part of CIE's continual commitment to maintaining best practice in assessment, CIE has begun to use different variants of some question papers for our most popular assessments with extremely large and widespread candidature, The question papers are closely related and the relationships between them have been thoroughly established using our assessment expertise. All versions of the paper give assessment of equal standard.

The content assessed by the examination papers and the type of questions are unchanged.

This change means that for this component there are now two variant Question Papers, Mark Schemes and Principal Examiner's Reports where previously there was only one. For any individual country, it is intended that only one variant is used. This document contains both variants which will give all Centres access to even more past examination material than is usually the case.

The diagram shows the relationship between the Question Papers, Mark Schemes and Principal Examiner's Reports.

Question Paper	Mark Scheme	Principal Examiner's Report
Introduction	Introduction	Introduction
First variant Question Paper	First variant Mark Scheme	First variant Principal Examiner's Report
Second variant Question Paper	Second variant Mark Scheme	Second variant Principal Examiner's Report

Who can I contact for further information on these changes?
Please direct any questions about this to CIE's Customer Services team at: international@cie.org.uk

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BIOLOGY

Paper 0610/31

Extended Theory

General comments

This proved to be a more difficult paper than in previous years. However, there were many straightforward questions which candidates could answer so there were few candidates who gained very low marks.
There were two questions that required candidates to carry out calculations, **Question 3 (c)** and **Question 5 (e)**. Most candidates carried out these calculations correctly even when they were unsure of some of the biology in the surrounding questions. Some candidates appeared not to have a calculator and so were unable to complete their calculations. **Question 3** required candidates to complete a graph and describe and explain what it showed. Candidates should be taught that the phrase 'Using data from the graph' means that they should quote figures from the graph in their answer. In **(e) (i)**, the Examiners looked for one of the rates given with its unit. Some candidates were not confident with the idea of pH. Many referred to the horizontal axis in the graph as 'time' or 'temperature' as if they were thinking about answers they had written before.

Some candidates answered **Question 5 (d)** on the structure and function of the kidney nephron very confidently. Others named random parts of the human body (usually the circulatory system) and gave appropriate functions. Some candidates left this blank. The structure and function of the kidney is a new topic introduced into the 2008 syllabus. It was clear that not all Centres realised this.

Less able candidates often struggled with comprehension where there was information provided in the question. They would be advised to look back to that information before answering. **Question 4 (e)** proved to be the most challenging question on the paper. Few candidates realised that this was a question about natural selection.

Candidates often cross out their answers and rewrite them on white space elsewhere in the paper such as blank pages. They sometimes run out of space and use the white space for continuation answers. Whenever they do this they must indicate where their rewritten and continuation answers are to be found.

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Question 1

(a) This proved to be an easy start to the paper. Most candidates gained 4 marks, but some gained only 2 because they confused style and sepal. Most candidates followed the instruction to use straight lines. The Examiners gave credit to lines that were not straight and to lines that stopped short of the appropriate boxes.

(b) The Examiners assumed that answers to this question were about stigmas of wind-pollinated flowers unless they were told otherwise. Quite a few candidates wrote about insect-pollinated flowers and gained credit if the features they identified were differences. Many ignored the second part of the question and did not refer to the significance of the differences that they had described. Many candidates described the stigmas of wind-pollinated flowers as 'sticky' a term that the Examiners just ignored as it was used indiscriminately to apply to both types of stigma.

(c) The word 'implications' in the question was perhaps difficult for candidates. Many simply described self-pollination. Some were still thinking about wind and insect-pollination. Many answers referred to the little variation that exists in plants that self-pollinate, but many were confused between self-pollination and asexual reproduction so lost marks. Very few candidates thought about the greater chances of pollination, the advantages of self-pollination when there are no other plants of the same species nearby and the little wastage of pollen. Some candidates did say that the plants are not dependent on agents of pollination, such as insects and wind, whilst others were confused

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here with seed dispersal. There seemed to be a common misconception that self-pollination leads to a reduced chance of seeds being dispersed.

Question 2

(a) Almost all defined the term *carnivore* in **(i)** correctly. Similarly, most gained a mark for **(ii)** as well, although some gave internal features or 'give birth to live young' as answers.

(b) Again almost all candidates gave good answers to both parts here. **Part (i)** attracted many good answers about the threats to wild dog populations. Almost all candidates gained one mark in **(ii)** for stating that the wild dogs would become extinct or would become endangered or rare. Few stated that they would be at risk of inbreeding.

(c) Many candidates constructed the food chain correctly. The Examiners accepted a variety of ways of identifying the trophic levels. Common mistakes were to:

- omit the grass from the food chain;
- omit the arrows or put them pointing in the wrong direction;
- draw a pyramid of numbers or biomass;
- mixing terms, e.g. (grass) producer and (antelope) herbivore;
- numbering the trophic levels from the antelope rather than the grass;
- not distinguishing between the wild dogs and lions by calling both carnivores, instead of referring to the lion as a top carnivore, or using the terms secondary and tertiary consumer.

Some candidates wasted time by including little drawings of the organisms involved.

(d) In **(i)** some candidates thought that the word 'measures' meant that things should be measured and wrote about counting how many antelopes the dogs would need to eat. Many gained one mark here but did not write enough to qualify their answer for the second mark. Answers to **(ii)** were often the converse of answers to **(b)(i)** and concerned preventing habitat destruction, legislating to ban hunting, control of predators and ensuring a good supply of prey animals.

(e) This proved to be a very demanding question. Although many candidates filled the space they rarely wrote a coherent and accurate description of the relevant stages of the nitrogen cycle. Many gained a mark or two by giving a correct fact in context, but few gave well reasoned answers. As a result, the Examiners saw very few good answers. Instead they found a great deal of misunderstanding. Many thought that nitrogen in the compounds in the bodies of the wild dogs had to be returned to the air by denitrifying bacteria and then fixed by nitrogen fixing bacteria. These two groups of bacteria appeared in many answers and neither was relevant to this question. Many answers stated that nitrogen fixing bacteria convert ammonia to nitrate.

In addition, the Examiners saw very few references to scavengers and detritivores. This was surprising, since birds such as vultures and crows play an important, and very visible role, in eating the bodies of dead animals. Some answers began with decomposition, but the Examiners only awarded a mark if this was linked to organisms such as bacteria and fungi. Candidates did not appear to know that decomposers break down protein into amino acids and then deaminate the amino acids releasing ammonia. Although many candidates mentioned nitrifying bacteria they did not state that they are responsible for the conversion of ammonia to nitrite and nitrite to nitrate. The Examiners awarded a mark to those candidates who omitted nitrite from this part of their answer stating that ammonia is converted to nitrate. Many candidates described the uptake of nitrate ions by plants.

It should be noted that this paper should have a large proportion of marks for extended writing and that candidates should be prepared to write at this sort of length on the topics identified as the supplement material.

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Question 3

This question tested practical, mathematical and graph drawing skills in the context of enzyme activity.

(a) Almost all candidates knew the term excretion in **(i)** although some wrote 'excreation' which was credited. Definitions of the term enzyme were excellent with most giving 'biological catalyst' for two marks.

(b) The Examiners thought that many candidates were unsure about the term *independent variable* as they often gave 'catalase' as the answer to **(i)**. pH was the expected answer and it seemed as if many candidates were uncertain about what this involved and many offered it as an answer to **(ii)**. Although catalase is the enzyme in potato that was investigated here, the Examiners did not consider 'catalase' a suitable answer as this cannot be controlled. Various aspects of the potato used certainly can be controlled, so the Examiners awarded marks for type, size, mass, quantity, or surface area of potato. 'Potato' unqualified was a common unsuccessful answer. Many candidates used the word 'amount' in this part and this gained credit if they wrote 'amount of potato' or 'amount of hydrogen peroxide'. However, candidates should be more careful and use the terms *volume* or *concentration* as 'amount' can be mistaken for both of these and sometimes marks are lost because of the confusion.

(c) Many candidates were unsure how to calculate the rate of enzyme activity at pH 8. Some rounded up their answer to 0.5 or 0.6 instead of expressing it to two decimal places to agree with the other rates given in the table. There were many blank spaces here, suggesting candidates either did not have a calculator with them, or were unsure how to carry out the calculation. The other figures in the table should have given a clue as to how to carry out the calculation.

(d) The Examiners were surprised how few candidates gained full marks here. Common errors were:

- not labelling the axes with 'pH' and 'rate of reaction';
- no units added to the vertical axis;
- inaccurate copying of the units;
- not joining the points with a line;
- continuing the line beyond pH 4 and pH 8;
- not using a sharp pencil to draw the line.

The Examiners accepted straight lines between the points if they were drawn with a ruler. They also accepted lines of best fit that peaked at pH 6 and went through or very close to the plotted points. Lines should not extend beyond the data points and the Examiners did not award the fourth marking point if this happened. Errors from **(c)**, including no responses, were carried forward to the graph so candidates were not penalised twice for calculating the rate for pH 8 incorrectly or failing to calculate it.

(e) Most candidates appeared not to know that 'Using data from the graph...' means that they should quote some data from the graph in their answer. There was a mark awarded for any of the plotted points used to illustrate a description. This 'data quote' mark was not awarded if the units were omitted. A common error was to state that pH 6 is the optimum pH – a statement that was appropriate to **(ii)**, but not **(i)**. Many gained one mark in **(ii)** by referring to the optimum pH, although some thought it was at a 'neutral pH' rather than at pH 6. Few candidates went on to explain about the effect of pH on enzymes, although many stated that the enzymes would be denatured at pH 8. Although this is not strictly true as there is still as much activity at pH 8 as at pH 4, the Examiners awarded a mark for this idea.

Question 4

(a) This question about the three species of zebra shown in Fig. 4.1 proved to be very difficult. Many candidates wrote about the names of the animals and how the binomial names show that they are three different species. The correct answer was to try to mate the zebras and make deductions based on the success or failure of these attempts. If mating is successful and the offspring are fertile, then the two parents are from the same species even if their phenotypes are different. If the offspring are sterile, then they are not from the same species. This is also likely to be the conclusion if the zebras took no notice of each other and refused to breed. Of course, there may be other reasons why two zebras do not mate despite the best efforts of the scientists! Some candidates suggested studying the DNA or the chromosomes of the zebras and the Examiners considered this to be an excellent alternative method.

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(b) Almost all candidates gave 'continuous' as the answer to **(i)**. Discrete variation is also an acceptable answer. Again, almost all gave *Equus gevyi* as the species that lives in the hottest environment as the answer to **(ii)**.

(c) The Examiners were looking for the term *phenotype* in **(i)**. Many otherwise good candidates wrote 'external features' but did not gain a mark. Many candidates were successful with their definitions of mutation in **(ii)**. The Examiners were looking for some idea of a change (1 mark) to DNA or chromosomes or genes (1 mark). They awarded one mark for answers that used the word 'change' in the correct context: 'change in genetic make-up' being an example.

(d) Candidates who knew the details of arthropods scored well in both parts. **Part (i)** asked about arthropods and **(ii)** asked about insects. This appeared to confuse some candidates who gave imprecise answers to both parts. A common mistake was to write 'three segments to the body' in **(ii)** as a feature of insects.

(e) This proved to be a very difficult question. Only the most observant candidates spotted in **(i)** that the stripes on the zebra's neck become horizontal when it bends to feed on the ground. This makes it less attractive to the tsetse flies which do not bite zebras while they are feeding. Candidates who saw this as a question about camouflage from predators such as lions gained one mark. Few candidates realised that **(ii)** was a question about natural selection. There were many pitfalls here not least the distinction between horizontal stripes v vertical stripes and few horizontal stripes v many horizontal stripes. The question was about the number of *horizontal stripes* and so candidates who dealt with vertical stripes did not gain marks. Many candidates wrote as if an individual zebra becomes more stripey and many then stated that the zebra should migrate to hot climates to gain more stripes. Some candidates wrote about artificial selection and others about genetic engineering. Good answers started by stating that mutation would be responsible for more horizontal stripes. Zebra with more horizontal stripes are less likely to get bitten by tsetse flies and so are less likely to succumb to disease. Zebra that survive are likely to be those with *more horizontal stripes* and they breed and leave more offspring than the animals with fewer stripes. Some candidates stated that the successful animals will pass on their characters or features to their offspring. The Examiners only awarded a mark for this idea if the answers referred to passing on *alleles* or *genes*. (The simplest way to think about this is for one gene to control the number of stripes, even though the stripes are more likely to be controlled by several genes each with a number of different alleles).

Question 5

(a) Most candidates defined the term *balanced diet* as one which provides nutrients in the correct proportions. Some named some or all of the nutrients. If they were named without referring to the word *nutrient* then the Examiners looked for a minimum of three, such as proteins, carbohydrates and vitamins. Water and fibre were included in the list of substances accepted. Few candidates referred to a balanced diet as one that provides sufficient energy. Some candidates referred to a diet providing a 'balance of nutrients'. This answer only gained one mark as the idea of *balance* is in the question. Candidates should be careful of using 'etc.': 'the right amounts of proteins, carbohydrates, etc.' only scored one mark.

(b) Most of the answers to **(i)** named the liver as the organ where deamination occurs. Many identified glucose as the answer to **(ii)** although there were quite a few who wrote 'oxygen'. Some candidates wrote a list and in this case no marks were awarded even if glucose was first in the list. The question asked for the name of compound **X** so only one name was accepted. The Examiner cannot be expected to choose the correct answer from a list. 'Carbohydrate' was not accepted here. Inevitably, many candidates identified the type of respiration as anaerobic, or even as 'An aerobic', which is incorrect. This immediately meant that no marks were gained for **(iii)**. There were many good answers with plenty of detail. Answers consisting solely of the equation for aerobic respiration did not gain any marks.

(c) This proved to be a challenging question as many candidates thought that they were being asked to describe the pathway in the circulation taken by urea. Some candidates wrote 'in the plasma' and gained a mark as did those few who stated that urea is in solution.

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(d) This question tested knowledge of the kidney nephron covering material that is a new addition to the 2008 syllabus. Some candidates gave exceptionally accurate and detailed answers showing a great depth of knowledge and understanding. Some candidates left the whole table blank and others wrote vague answers about different blood vessels in the body, such as vena cava and aorta. It proved to be quite difficult for candidates to distinguish between the functions of the glomerulus and Bowman's capsule. Good answers referred to the glomerulus as being the site of filtration or referred to the high blood pressure that achieves pressure filtration. The capsule was described as being the place where the filtrate collected. References to diffusion for the functions of **A** and **B** were rejected. The Examiners accepted *tubule* as the name of **C** and looked for some reference to reabsorption as the function. Some candidates referred to substances being absorbed back into the blood or to the active uptake of glucose and/or salts. These answers were accepted, but some candidates stated that the substances 'go back into the kidney' which was not. Candidates were often imprecise in describing the function of the collecting duct (**D**). They stated that it takes urine from the kidney to the bladder. The Examiners accepted taking urine to the pelvis or ureter but no further than the ureter. Those candidates who stated that this is a site of water reabsorption gained a mark.

(e) Candidates who did not write any answers to **(d)** were often able to score full marks here. In fact, there were many correct answers to the calculations in **(i)** and **(ii)**. In **(i)**, many forgot to multiply by 60. If this happened then the Examiners awarded no marks but allowed the *error carried forward* (ecf) rule for answers to **(ii)** where it was possible to gain two marks if the answer from **(i)** had been used to calculate the percentage. A common incorrect answer to **(i)** was 16992 (rather than 1699.2) which led to 0.01% (rather than 0.1%) in **(ii)**. In this case the first answer may have gained one mark if the correct working had been shown and the second answer would have gained two marks as an *ecf*. Candidates must be careful about the placing of decimal points in their numerical answers.

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BIOLOGY

Paper 0610/32

Extended Theory

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here with seed dispersal. There seemed to be a common misconception that self-pollination leads to a reduced chance of seeds being dispersed.

Question 2

Candidates who realised that **(a) (ii)** required a description of eutrophication did well in this question. Part **(c) (iv)** proved more challenging as candidates often ignored the instruction to use factors other than those already mentioned in the question. 'The study of .....' is a definition of ecology not a definition of ecosystem.

(a) Some definitions of *ecosystem* in **(i)** were very good indeed. However, many just referred to the organisms and made no mention of the physical features of ecosystems. Some candidates also stated that an ecosystem refers to all the organisms living in a habitat. This was rejected by the Examiners since the organisms occupy different habitats within the ecosystem. Those who stated that an ecosystem comprises many habitats gained a mark. Weaker candidates lost marks in **(ii)** because they were imprecise. For example, many stated that *Salvinia molesta* used up oxygen in the water rather than explaining that there was less photosynthesis by aquatic plants or that aerobic bacteria used up oxygen in respiration. Some candidates stated that there would be too much carbon dioxide in the water as a result of there being too many plants – an idea that did not gain credit. Better candidates explained that *S. molesta* would grow over the surface of the water restricting the light available to fully submerged aquatic plants. These would photosynthesise less and even die. Dead plants would be decomposed by bacteria so reducing the oxygen concentration in the water. Many then linked the decrease in oxygen availability to the death of fish. Some referred to the Biological Oxygen Demand (BOD) in this context. Some candidates realised that death of aquatic plants would mean less food available to aquatic herbivores leading to a disruption of food chains.

(b) Many candidates gave the obvious answer in **(i)** that herbicides may kill other plants not just the intended target species. Some lost this mark by referring to 'organisms' rather than plants. Candidates are expected to know the meaning of the term *herbicide*. They often stated that the beetle would only eat *S. molesta* and some used the word *specific* in this context. Some also mentioned accumulation of herbicide in food chains and the development of resistance to herbicides. It was surprising that few, if any, candidates made reference in **(ii)** to other better known examples of biological control that have gone wrong such as the introduction of the cane toad in Australia. However, candidates did state that the beetle is unlikely to have a natural predator in Namibia and may eat species other than *S. molesta*.

(c) Most candidates drew an appropriate curve in **(i)**; the Examiners ignored any death phases and accepted any stationary phases that showed fluctuations. Some candidates drew a lag phase that showed a *decrease* and so lost the mark. If the curve was a good 'S' shape then the labelling tended to be correct, although some transposed the labels for the lag and log stages. Some omitted labelling the lag phase altogether. Most candidates realised that space or grazing by beetles were responsible for limiting the growth of *S. molesta* in **(iii)**. **Part (iv)** proved difficult as some candidates identified correct factors, but wrote about how they influence the *increase* in the growth of the plants, rather than *limit* their growth. Lack of precision cost candidates some marks here. Many referred to 'light' rather than *light intensity* or to 'carbon dioxide' rather the *carbon dioxide concentration*. A good choice of factor was usually important. It was often difficult to explain how some factors limit the growth of *S. molesta*. Light intensity, carbon dioxide concentration, grazing (if not given in **part (iii)**), disease and named minerals such as nitrate ions and magnesium ions were successful choices.

Question 3

This question tested practical, mathematical and graph drawing skills in the context of enzyme activity.

(a) Almost all candidates knew the term excretion in **(i)** although some wrote 'excreation' which was credited. Definitions of the term enzyme were excellent with most giving 'biological catalyst' for two marks.

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(b) The Examiners thought that many candidates were unsure about the term *independent variable* as they often gave 'catalase' as the answer to **(i)**. pH was the expected answer and it seemed as if many candidates were uncertain about what this involved and many offered it as an answer to **(ii)**. Although catalase is the enzyme in potato that was investigated here, the Examiners did not consider 'catalase' a suitable answer as this cannot be controlled. Various aspects of the potato used certainly can be controlled, so the Examiners awarded marks for type, size, mass, quantity, or surface area of potato. 'Potato' unqualified was a common unsuccessful answer. Many candidates used the word 'amount' in this part and this gained credit if they wrote 'amount of potato' or 'amount of hydrogen peroxide'. However, candidates should be more careful and use the terms *volume* or *concentration* as 'amount' can be mistaken for both of these and sometimes marks are lost because of the confusion.

(c) Many candidates were unsure how to calculate the rate of enzyme activity at pH 8. Some rounded up their answer to 0.5 or 0.6 instead of expressing it to two decimal places to agree with the other rates given in the table. There were many blank spaces here, suggesting candidates did not have a calculator with them, or were unsure how to carry out the calculation. The other figures in the table should have given a clue as to how to carry out the calculation.

(d) The Examiners were surprised how few candidates gained full marks here. Common errors were:

- not labelling the axes with 'pH' and 'rate of reaction';
- no units added to the vertical axis;
- inaccurate copying of the units;
- not joining the points with a line;
- continuing the line beyond pH 4 and pH 8;
- not using a sharp pencil to draw the line.

The Examiners accepted straight lines between the points if they were drawn with a ruler. They also accepted lines of best fit that peaked at pH 6 and went through or very close to the plotted points. Lines should not extend beyond the data points and the Examiners did not award the fourth marking point if this happened. Errors from **(c)**, including no responses, were carried forward to the graph so candidates were not penalised twice for calculating the rate for pH 8 incorrectly or failing to calculate it.

(e) Most candidates appeared not to know that 'Using data from the graph...' means that they should quote some data from the graph in their answer. There was a mark awarded for any of the plotted points used to illustrate a description. This 'data quote' mark was not awarded if the units were omitted. A common error was to state that pH 6 is the optimum pH – a statement that was appropriate to **(ii)**, but not **(i)**. Many gained one mark in **(ii)** by referring to the optimum pH, although some thought it was at a 'neutral pH' rather than at pH 6. Few candidates went on to explain about the effect of pH on enzymes, although many stated that the enzymes would be denatured at pH 8. Although this is not strictly true as there is still as much activity at pH 8 as at pH 4, the Examiners awarded a mark for this idea.

Question 4

(a) This question about the three species of zebra shown in Fig. 4.1 proved to be very difficult. Many candidates wrote about the names of the animals and how the binomial names show that they are three different species. The correct answer was to try to mate the zebras and make deductions based on the success or failure of these attempts . If mating is successful and the offspring are fertile, then the two parents are from the same species even if their phenotypes are different. If the offspring are sterile, then they are not from the same species. This is also likely to be the conclusion if the zebras took no notice of each other and refused to breed. Of course, there may be other reasons why two zebras do not mate despite the best efforts of the scientists! Some candidates suggested studying the DNA or the chromosomes of the zebras and the Examiners considered this to be an excellent alternative method.

(b) Almost all candidates gave 'continuous' as the answer to **(i)**. Discrete variation is also an acceptable answer. Again, almost all gave *Equus gevyi* as the species that lives in the hottest environment as the answer to **(ii)**.

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(c) The Examiners were looking for the term *phenotype* in **part (i)**. Many otherwise good candidates wrote 'external features' but did not gain a mark. Many candidates were successful with their definitions of mutation in **(ii)**. The Examiners were looking for some idea of a change (1 mark) to DNA or chromosomes or genes (1 mark). They awarded one mark for answers that used the word 'change' in the correct context: 'change in genetic make-up' being an example.

(d) Candidates who knew the details of arthropods scored well in both parts. **Part (i)** asked about arthropods and **(ii)** asked about insects. This appeared to confuse some candidates who gave imprecise answers to both parts. A common mistake was to write 'three segments to the body' in **part (ii)** as a feature of insects.

(e) This proved to be a very difficult question. Only the most observant candidates spotted in **(i)** that the stripes on the zebra's neck become horizontal when it bends to feed on the ground. This makes it less attractive to the tsetse flies which do not bite zebras while they are feeding. Candidates who saw this as a question about camouflage from predators such as lions gained one mark. Few candidates realised that **(ii)** was a question about natural selection. There were many pitfalls here not least the distinction between horizontal stripes v vertical stripes and few horizontal stripes v many horizontal stripes. The question was about the number of *horizontal stripes* and so candidates who dealt with vertical stripes did not gain marks. Many candidates wrote as if an individual zebra becomes more stripey and many then stated that the zebra should migrate to hot climates to gain more stripes. Some candidates wrote about artificial selection and others about genetic engineering. Good answers started by stating that mutation would be responsible for more horizontal stripes. Zebra with more horizontal stripes are less likely to get bitten by tsetse flies and so are less likely to succumb to disease. Zebra that survive are likely to be those with *more horizontal stripes* and they breed and leave more offspring than the animals with fewer stripes. Some candidates stated that the successful animals will pass on their characters or features to their offspring. The Examiners only awarded a mark for this idea if the answers referred to passing on *alleles* or *genes*. (The simplest way to think about this is for one gene to control the number of stripes, whereas in fact the stripes are more likely to be controlled by several genes each with a number of different alleles).

Question 5

(a) Most candidates defined the term *balanced diet* as one which provides nutrients in the correct proportions. Some named some or all of the nutrients. If they named them without referring to the word *nutrient* then the Examiners looked for a minimum of three, such as proteins, carbohydrates and vitamins. Water and fibre were included in the list of substances accepted. Few candidates referred to a balanced diet as one that provides sufficient energy. Some candidates referred to a diet providing a 'balance of nutrients'. This answer only gained one mark as the idea of *balance* is in the question. Candidates should be careful of using 'etc.': 'the right amounts of proteins, carbohydrates, etc.' only scored one mark.

(b) Most of the answers to **(i)** named the liver as the organ where deamination occurs. Many identified glucose as the answer to **(ii)** although there were quite a few who wrote 'oxygen'. Some candidates wrote a list and in this case no marks were awarded even if glucose was first in the list. The question asked for the name of compound **X** so only one name was accepted. The Examiner cannot be expected to choose the correct answer from a list. 'Carbohydrate' was not accepted here. Inevitably, many candidates identified the type of respiration as anaerobic, or even as 'An aerobic', which is incorrect. This immediately meant that they gained no marks for **(iii)**. There were many good answers with plenty of detail. Answers consisting solely of the equation for aerobic respiration did not gain any marks.

(c) This proved to be a challenging question as many candidates thought that they were being asked to describe the pathway in the circulation taken by urea. Some candidates wrote 'in the plasma' and gained a mark as did those few who stated that urea is in solution.

(d) This question tested knowledge of the kidney nephron covering material that is a new addition to the 2008 syllabus. Some candidates gave exceptionally accurate and detailed answers showing a great depth of knowledge and understanding. Some candidates left the whole table blank and others wrote vague answers about different blood vessels in the body, such as vena cava and aorta. It proved to be quite difficult for candidates to distinguish between the functions of the glomerulus and Bowman's capsule. Good answers referred to the glomerulus as being the site of filtration or referred to the high blood pressure that achieves pressure filtration. The capsule was

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described as being the place where the filtrate collected. References to diffusion for the functions of **A** and **B** were rejected. The Examiners accepted *tubule* as the name of **C** and looked for some reference to reabsorption as the function. Some candidates referred to substances being absorbed back into the blood or to the active uptake of glucose and/or salts. These answers were accepted, but some candidates stated that the substances 'go back into the kidney' which was not. Candidates were often imprecise in describing the function of the collecting duct (**D**). They stated that it takes urine from the kidney to the bladder. The Examiners accepted taking urine to the pelvis or ureter but no further than the ureter. Some candidates stated that this is a site of water reabsorption and gained a mark.

(e) Candidates who did not write any answers to **(d)** were often able to score full marks here. In fact, there were many correct answers to the calculations in **(i)** and **(ii)**. In **(i)**, many forgot to multiply by 60. If this happened then the Examiners awarded no marks but allowed the *error carried forward* (ecf) rule for answers to **(ii)** where it was possible to gain two marks if the answer from **(i)** had been used to calculate the percentage. A common incorrect answer to **(i)** was 16992 (rather than 1699.2) which led to 0.01% (rather than 0.1%) in **(ii)**. In this case the first answer may have gained one mark if the correct working had been shown and the second answer would have gained two marks as an *ecf*. Candidates must be careful about the placing of decimal points in their numerical answers.

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Paper 0610/04

Coursework

General comments

The great majority of Centres entering candidates for Paper 4 have chosen tasks and assessed tasks entirely appropriately. Most continue to use between 8 and 12 tasks, which gives plenty of opportunity for poor scores to be discarded and the best two scores for each skill to be used to generate the final mark.

Where things go wrong, the cause is almost always a result of poor choice of task. For Skill C1, candidates need to have the opportunity to make at least one decision for themselves if they are to meet the criteria for a mark of 6. Tasks which have no more than a simple list of instructions to be followed are unlikely to allow access to the highest marks.

For Skill C2, many Centres use at least one task that involves recording observations in the form of a drawing, as well as some involving the collection and recording of quantitative results. Once again, the choice of task will determine whether the highest levels of this Skill can be reached by the candidates. Experiments involving the relationship between a continuous independent variable (e.g. a range of temperatures) and a dependent variable (e.g. the rate of oxygen usage during respiration, or the rate of germination of seeds) perform best here.

For Skills C3 and C4, this same type of task – that is, involving continuously varying independent and dependent variables – makes it possible for candidates to show their abilities at the highest levels. A few Centres chose poor experiments here and as a result restricted the maximum marks that their candidates could achieve. For example, a simple experiment 'to test a leaf for the presence of starch' provides very little opportunity for recording results (C2) and almost none for processing them or commenting on sources of experimental error (C3). An investigation testing a hypothesis such as 'The rate of photosynthesis of an aquatic plant increases as light intensity increases' would be a much better choice. An investigation to find out if seeds need water for germination (C3 and C4) is a little better, but still does not provide sufficient results for candidates to really show what they can do, because in general most of the seeds with water germinate while none of those without it do. There is almost no possibility of demonstrating high abilities in processing results or discussing sources of error. A better version of this investigation could be to investigate the effect of storage time (or some other continuously varying factor) on the rate of germination of seeds.

Skill C4 is the most demanding of the four practical skills that are assessed. Candidates need to be taught how to go about this, and how to write down what they do in a way that demonstrates their abilities to the best advantage. For example, they should write down the variables that they need to control, and describe how they will do this. It is not enough just to state that 'all other factors will be kept constant'. They also need to understand the difference between evaluating procedures (that is, stating significant sources of error or uncertainty) and suggesting modifications (that is, suggesting how their method could be improved). These are high level skills, and they help to discriminate between candidates performing at levels of 6, 5 and 4.

Group work is immensely valuable in helping candidates to develop their skills, not only in practical work but also in other aspects of their biology learning. However, Centres must ensure that work used for coursework assessment is entirely the candidate's own work, with no input from elsewhere (for example other candidates, parents or other relatives, the teacher). For most Centres, this means that they require candidates to complete their coursework tasks in class, under supervision.

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Paper 0610/05

Practical Test

General comments

Once again, a significant number of Centres did not submit Supervisor's Reports or a seating plan, although fewer than in previous sessions.

The Supervisor's Reports are an invaluable resource to Examiners in assessing the work of candidates. It could be the case that an experiment or material behaved in a way that was not anticipated or that candidates were supplied with a specimen that had features that were not expected and so had not been considered in the mark scheme. Under such circumstances, candidates can gain credit for what they could do and observe, even if the material had looked or behaved in an unexpected way. Examiners find that any additional information can be helpful, so Centres should include any information that they feel would be of assistance, even if it is not specifically requested. Identification and/or drawing of specimens supplied to the candidates are always a good idea. Some Centres in the past have supplied photographs of specimens and test results, both of which were useful. It should be noted that the Supervisor's Report form is now found in the Confidential Instructions rather than the question paper itself.

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

There is an increasing tendency for candidates to use ballpoint pen to draw diagrams and graphs. Centres should advise their candidates to use a well-sharpened pencil (preferably 2B) for diagrams and graphs. The lines and points should then be clear and unambiguous and any errors can be easily erased.

Comments on specific questions

Question 1

(a) Most candidates were able to complete the table showing the cooling of the water in the two containers. Credit was not given for recording to more than 0.5^{o}C and, given some of the very strange temperatures recorded; some candidates appeared to be unable to read a thermometer correctly. Although the instructions clearly stated that candidates should record the temperature of the hot water at the start, some appear to have recorded either the air temperature or the temperature of the water that was to be used to keep the paper towel wet. It was also clear that some candidates did not work in an organised way as a significant number appeared to confuse the containers.

(b) The overall quality of the graphs seen this year was rather disappointing. A significant number of candidates did not label the axes at all while others gave incomplete labelling, typically omitting the units on one or both axes. Many unsuitable scales were seen for the y axis. A scale of 10 squares to represent 15 or to represent 7 makes it almost impossible for accurate plotting of data. Where the data points are to be joined, then they should be joined with a ruler rather than being drawn freehand. Lines of best fit should clearly correspond to the trend rather than ignoring points that do not appear to fit. Some candidates did not provide a key or label to indicate which line referred to the dry container and which referred to the wet container. A significant number of candidates drew a bar chart rather than a line graph. A bar chart was not appropriate in this case.

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(c)(i) The answers to this part of the question often failed to score full marks, as they did not elaborate on the basic statement that the wet container cooled more, or faster, than the dry container. With two marks available, a correct reference to the data or gradient of the line would have scored the second mark. It was also clear that many candidates had not read the whole question before starting work, as many continued to give a correct answer to **(ii)** at this point. It is always a good idea to read the whole question first, or at least to read **(c)(i)**, **(ii)** and **(iii)** before answering **(c)(i)**, so that the correct information is given in response to the different questions asked.

(ii) Most candidates were unable to make the link between the wet covering of the container and the evaporation of that water resulting in the cooling of the water inside the container. They seemed to think that it was simply as a result of the temperature difference. There was also a tendency to restrict the answer to either the wet or dry container, but both contributed to the results and so both should have been referred to in the answer.

(iii) Many candidates referred primarily to general methods of cooling the body such as vasodilation and the flattening of hair and only mentioned sweating at some point in their answer, although it might be given as an afterthought. Those who understand how sweating cools the body then mentioned evaporation and its role in removing heat from the body to provide the energy for evaporation. It is interesting to note that candidates who clearly understood about sweating and evaporation did not make the connection between this and the container covered with wet paper towel.

(d)(i) Most candidates could supply one relevant suggestion. However, many referred to ways in which they could improve the apparatus or method at this point instead of in **(ii)**.

(ii) Candidates supplied information but it was not always relevant. Some did not understand what was required and simply stated various steps of the procedure.

Question 2

(a) The candidates who had experience of handling and drawing specimens answered part **(a)** well. The quality of drawing was, in many cases, poor. Candidates should be reminded that biological diagrams should not be drawn in pen or biro. The drawing should be large, clear, unshaded and have a clear outline rather than a sketchy outline. Even an unlabelled drawing here would have scored three marks. Label lines should point clearly to the structure concerned and should not cross each other.

(b)(i) Candidates were expected to compare the same feature on the same line. Some simply wrote down a random selection of points in any order on each side of the table. In a question of this type, candidates should be encouraged to keep to simple observations such as colour, size and shape. Some candidates over-stretched themselves by making comparisons between obscure or irrelevant features. Given that the tomato is a true fruit and that apples and pears are false fruits, there were many misleading statements concerning the pericarp.

(ii) This should have been a straightforward question, but many candidates stated that the two specimens were fruits (which had been stated in the question) or concentrated on the dispersal mechanisms. Once again, simple similarities were overlooked in favour of more complex statements that might not be credited because the terminology was incorrect.

(c) The question referred to the *comparison* of the reducing sugar content of the two fruits. Many candidates lacked confidence in the practical detail, either providing no detail or giving incorrect chemicals (such as using biuret or iodine solution). Of those who knew the procedure for testing for reducing sugar, many did not answer the question. As the question required the reducing sugar content of the fruits to be compared, it was essential that the quantities of fruit should be equal; that it should be crushed with equal volumes of water and that each should be heated with the same volume of Benedict's reagent for the same time. Those candidates who answered as a straightforward description of the test for a reducing sugar would have scored badly. It was also important to stress the comparison in the outcome of the test, rather than simply stating the outcome if reducing sugar was present or absent. Some candidates did not include any suitable safety precautions, indicating a lack of confidence in carrying out practical work.

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Paper 0610/06
Alternative to Practical

General comments

The standard of expression in English was sound. It was not obvious that candidates were unable to attempt all of the questions or that there was insufficient time for the paper to be completed in the hour allowed. This paper was comparable to the paper for last year in terms of difficulty. All parts to the questions were answered well by candidates, but points were spread out amongst different candidates. There were parts of some questions based on investigative and planning skills (C4), which some candidates found difficult and perhaps require further practise. There was evidence that some candidates had not experienced some of the practical techniques and investigations and so based their answers on general knowledge. Their suggestions were credited wherever possible. Drawing skills were generally good but there was still a lack of labels. Candidates should be made aware of the differences in responses that they should make when questions involve terms such as compare, describe or explain.

Comments on specific questions

Question 1

This question was based on cooling rates measuring the temperature of water in two flasks with different coverings.

(a) (i) With a dependant and an independent variable, the data was expected to be plotted as a line graph. Most candidates plotted the data with the axes orientated correctly with the time in minutes on the horizontal x axis. There are still some candidates who omit to label the axes or to include the units. One difficulty shown by many candidates was the choice of scale. It is not necessary for the temperature to start from 0 °C. If the scale started from 40 °C, a more suitable scale to fill the printed grid was possible. A key was usually given either by labelling the lines or a separate key. Ideally the points for each set should be given using a different symbol. The plotted points should be joined point to point with a ruled line rather than a line of best fit.

It was noted that some candidates did attempt to draw histograms. These are used when plotting frequency graphs with continuous data not three different sets of data for flasks A, B and C.

(ii) Some candidates compared the cooling of the water in the flasks by describing the general trends without any reference to the data that had just been plotted. Most candidates handled the data by comparing the final readings, finding the difference between the start temperature and the last reading, comparing the temperature difference between the two flasks in each part of the question or measuring the gradient of each of the 'curves' from the graph.

(iii) The explanation given by candidates was often based on the idea of insulation in Flask B which trapped the warm air preventing temperature loss. The able candidates referred to the water evaporating from the wet cotton wool around Flask C and that this explained why the temperature of the water in the flask dropped lower than in the other two flasks. Few candidates referred to the heat radiating from Flask A which had no covering.

(b) (i) Most candidates were able to describe from the introduction and the details in Fig. 1.1, three ways in which the investigation was 'fair'. A common error was to state that the three flasks had the same temperature and omitting 'at the start' because it was the drop in temperature which was the dependent variable. Weaker candidates described ways to improve the accuracy and reliability of the investigation which was the response expected for the next question.

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(ii) These points concerning improving the reliability of the investigation were well described and the most common answer was based on repeating the cooling measurements to increase reliability.

The other points such as erecting a shield to prevent draughts, stirring the water, more frequent temperature readings were often noted. The idea of increasing the time for collecting the cooling temperatures was not considered creditworthy.

Question 2

(a) There was a wide variation in the standard of drawing of the cut surface of tomato shown in Fig. 2.1. Many drawings were accurate, well proportioned and neat with clear outlines of the structures shown and with correct labels. At the other end of the range there were almost unrecognisable, shaded sketches. A biological drawing should show the features of the fruit accurately in clear lines with no artistic shading. Some candidates drew both the apple and the tomato, so were not following the instructions. There were still too many drawings without labels. The label lines need to go accurately to the structure concerned, not have lines ending over a centimetre from the structure, pointing vaguely in the direction of it. The labels were often inaccurate. This tomato is a fruit and yet many candidates labelled the seeds as ovules. Details were often missed, such as the seed chamber on the left hand side was considerably larger than the one on the right.

(b) (i) The comparison points were based on the differences which were **visible** in the two photographs. Not many candidates gave four correct differences. Many points were based on knowledge rather than observable differences, such as actual colour, texture e.g. hardness, or 'watery'. Sometimes more than four differences were given but were not paired even though the introduction of lines in a table was intended to help candidates.

(ii) The similarities were described based on shape of the fruit, the presence of seeds, stalk or sepals.

(c) Although the reducing sugar test based on the Benedict's' test was familiar to many candidates the procedure to carry out the test to compare the reducing sugar content of the two fruits was not accurately described. A significant number of candidates did not mention any safety precautions. However, some candidates identified and described the dangers but failed to address what suitable precautions could be taken to avoid these dangers. Only a few candidates described the wrong test for reducing sugars. The most common error was to describe the starch / iodine solution test.

There were a range of inappropriate tests described not based on the food test outlined in the syllabus. These ranged from exposing the fruits to flies in order to count the number attracted to the sugars, to fermentation and growth of microorganisms such as yeast.

Question 3

(a) (i) The stigma (A) and style (B) were structures which most candidates were able to identify. However, C (ovule) was not. It was identified incorrectly as egg, ovum or even ovary.

(ii) Only a small number of candidates correctly drew the pollen tube which extended down the style and entered through the micropyle, the gap between the two integuments. The most common error was to show the pollen tube entering the ovule from the right by the label line for structure C, or to rule a straight line from the stigma to the ovule.

(b) (i) Most candidates measured the diameter of the pollen grain correctly in millimetres, whilst others confused millimetres and centimetres. The distance that the pollen tube needed to grow was shown well by some candidates and others made an approximate guess.

(ii) This calculation was a simple one based on the measurements given in **(i),** following the instructions, so many candidates gained these marks. There were some candidates who divided the two figures incorrectly or subtracted the figures.

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