BIOLOGY

Paper 0610/01
Multiple Choice

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

General comments

Candidates generally coped admirably with the paper. There were many very high marks, including full marks, but also a spread across the entire range. All questions made a significant contribution to the test. There was evidence that even the best candidates may have penalised themselves by failing to read the question carefully and then having to take additional time to understand what was being asked before selecting an answer.

Comments on individual questions

Question 3

This question, far more than any other, tested the requirement of candidates to first to read and understand the question. The evidence is that two-thirds of them failed to do so. The diagram shown was of *half* a flower, in fact, a perfectly normal form of illustration for such a specimen. Failing to realise that it was a half flower meant that the great majority of candidates counted the number of stamens shown and operated with that number when then using the key, leading them inaccurately to **B** as the answer. With four stamens

shown in the half-flower, it would follow that the whole flower contained eight stamens. Significantly, more of the best candidates made this error than not.

Question 4

It was a little disappointing that almost a quarter of candidates thought that xylem has absorption as a principle function. Whilst it is true that water must be absorbed into the xylem, those who selected **B** as the answer were failing to recognise the importance of the xylem in support.

Question 8

This question proved to be rather too easy. Nevertheless, the fact that muscles operate by contraction is a fundamental biological concept that is clearly well known.

Question 14

Statistically, this question performed well, but this was in part due to a rather surprising number of candidates believing that starch might be conducted by the xylem. There may have been confusion between the functions of xylem and phloem, but to believe that insoluble starch is conducted at all is a significant error.

Question 21

Weaker candidates failed to link the gradual decline in lactic acid in muscles with the recovery process after the race, believing instead that the decline would occur whilst the race is in progress.

Question 23

This was quite a demanding question with a table to read and understand. The question accurately identified the more able candidates who did well to select the correct response.

Question 24

The requisite knowledge in order to be successful with this question was to be able to differentiate between the radius and the ulna, which, unfortunately, rather too many of the better candidates struggled to do. That the triceps has its insertion on the ulna, and the biceps on the radius is fundamental knowledge.

Question 26

Candidates displayed reassuring knowledge of this aspect of birth control.

Question 27

Somewhat surprisingly, almost a third of candidates thought that fertilisation would occur between seed dispersal and fertilisation. Again, those who had not read the question carefully, may have missed reference to *seed* dispersal in the question, and worked under the misapprehension that they were considering dispersal of pollen.

Question 28

This was the second most difficult question on the paper, but only because it exposed the common misbelief that germination of seeds requires light. That over 42% should believe that light is needed rather than enzymes was a significant revelation.

Question 29

Candidates showed less than a firm grasp of the fact that growth can occur only when an organism shows an increase in *dry* mass.

Question 34

The question asked about a pyramid of biomass, not a pyramid of numbers. Close attention to the wording of the question is essential.

Question 39

It was hoped that candidates would appreciate that the fewest individuals in the water samples would be an indication of the degree of pollution, rather than the lowest number of species.

BIOLOGY

Paper 0610/02

Core Theory

General comments

This year there were far fewer candidates who did not attempt all parts of all questions. Where this did occur, it did not seem to be linked to insufficient time, but rather to candidates who appeared to be inadequately prepared for the demands of the questions. There were candidates who showed very limited knowledge and understanding of some syllabus topics and there was virtually no evidence that there were candidates who did not find the paper demanding in at least some of its aspects. Responses to various sections of questions again revealed certain misconceptions and misunderstandings. However, there was evidence in a number of places, indicated in the comments on specific questions, that candidates had not read the questions carefully 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. Candidates should also take note of the mark allocation for each question section and the space provided for the answer when considering their responses. This especially important when a specific number of responses are requested as in **Question 1 (b)(i)**, **Question 2 (b)(i)**, **Question 5 (c)** and **(d)**, **Question 8 (c)(iii)** and **Question 9 (a)(iii)**. Examiners reported that there seemed to be an increase in the degree of illegibility of candidates' responses.

Comments on specific questions

Question 1

The responses to this question suggested that the majority of candidates had a very poor knowledge and understanding of the binomial naming system. Despite the information given in the introduction to both parts **(a)** and **(b)** very few candidates were completely successful. In **(a)** many candidates confused the genus name with that which identifies a species within a genus and reversed the two parts of the binomial naming system. A significant number offered the full scientific name for the genus and the common name for the species. In **(b)(i)** it was not uncommon to have responses completely composed of whole, or parts of the scientific names. Also many candidates offered the common names of two individuals from two different genera. In **(b)(ii)** many candidates ignored the request for the genus name and simply named the cheetah, and additionally there were those who named either of the other two genera.

Question 2

In **(a)(i)** most candidates were able to relate the second source of carbon monoxide to tobacco, cigarettes or smoking but then very few made adequate or sensible use of the data in the table to answer **(ii)** or **(iii)**. This was especially notable in **(a)(ii)** where they named the source but then did not develop their responses logically. The table shows that for both day and night time drivers the smokers have 3.4 % more of their haemoglobin inactivated than the non-smokers. In **(iii)** many did identify the 1.3% difference between day and night time whether they were smokers or non-smokers but then added these two values together. The majority of candidates were able to identify nicotine and tar as being harmful although there were some who introduced alcohol into the response. Some candidates dealt with carbon monoxide despite the request for "other …… apart form carbon monoxide" suggesting that the question was not read carefully enough. Also, in **(b)(i)** a small number of candidates identified organs of the body rather than components of cigarette smoke. Too few seemed to be aware of the real effects of smoking on a fetus prior to birth and incorrectly suggested that all such babies at birth were deformed, lacked limbs, had lung cancer or developed Down's syndrome.

Question 3

In **(a)** many candidates sensibly suggested that the radioactive strontium would accumulate in the stomach or other regions of the alimentary canal. However, they should have appreciated that materials in this system are either absorbed or are egested and thus would be continually dispersed from the system. Very many candidates utilised the information that strontium is similar to calcium and correctly explained that the accumulation would be in the bones or teeth. In **(b)** a significant number linked the fact that the strontium was radioactive to their knowledge and understanding of the effect of radiation on body cells.

Question 4

The most disappointing aspect of responses in this sentence completion question was the use of the term allele in the first blank space. The other four blanks were completed correctly with varying degrees of success, although when the second blank was correctly identified as meiosis many went on the fill in haploid for the state of the zygote. The overall weakness of the responses suggested a lack of familiarity with this area of knowledge and understanding. However Examiners did not report any candidates using terms not in the list as has happened in the past with this type of question.

Question 5

In **(a)** the majority of candidates identified the three structures **P**, **Q** and **R** but there were a significant number of responses where the spelling of urethra was erroneous and could have been a hybrid word with ureter. A few candidates named structures from the female reproductive system. Far weaker was the labelling of the diagram in **(b)**. It was uncommon for both labels to point clearly to the testis and many label lines finished on the epididymis. Whether this was a lack of understanding or careless labelling is difficult to resolve. The other popular site for the production of testosterone was the seminal vesicles. When candidates are describing the effects of a hormone at puberty, as in **(c)**, they should try to be specific. References to the growth of hair are inadequate. The response should identify the site as the pubic region or the face in males. Similarly a reference to a change in the voice should state if there is a rise or fall in tone. Also, casual comments, such as hair in the testicles, raised questions about the knowledge and understanding of the candidates and did not gain credit. A reference to hair developing on the scrotum would have gained credit. In **(d)** many identified the basis for two routes for the transfer of HIV but very few gave sufficient detail to gain full credit. In the case of shared needles, and other sharp objects, few candidates made the point that the needle had to be infected or not to have been sterilised between users. Despite the start of the question “Apart from intercourse,…” there were still a number who quoted this as one of their examples. A number of candidates quoted popular misconceptions, such as kissing, as a feasible route for the transfer of the infection.

Question 6

There were numbers of candidates who in either **(a)(i)** or **(ii),** or even in both, made no attempt to respond. In **(a)(i)** the commonest error was to make each level of the pyramid narrower than the one below when it should have been apparent that the number of ticks would be greater than the number of buffalo and thus the third layer would be wider than the second. Also, not infrequently the ticks were shown as the top layer as if they were parasites of the oxpecker birds. In **(ii)** many candidates had the correct type of outline for the pyramid but then failed to correctly identify the 4 trophic levels, either as 1 – 4 starting from the grass at the base or as producers and first, second and third consumers. There were versions of each pyramid in which the grass or producer was at the top and the pyramid was inverted. Some candidates drew food chains rather than the appropriate pyramid. In **(b)** many candidates concentrated on energy flow through food chains and failed to simply point out the differences between the nutrition of producers and consumers and the fact that producers utilise photosynthesis and produce their own food while the consumers are dependent on ready made food. There were a small number of candidates who made correct use of the terms autotrophic and heterotrophic.

Question 7

A significant number of candidates described the processes involved rather than naming them in **(a)(i)**. In **(ii)** it was expected that candidates would name either bacteria or fungi but many chose animals, both vertebrates and invertebrates, unrelated to the process of decomposition despite the reference to microorganisms in the diagram. Some candidates simply repeated the term microorganisms that appeared in the diagram itself. In **(b)** most candidates recognised the part played by increasing use of fossil fuels and vehicles while others also referred to the effects of deforestation and the increasing world population.

However, many responses digressed into accounts of CFCs, ozone depletion and global warming thereby gaining no credit.

Question 8

Few candidates were able to work out that muscle D was antagonistic to muscle A or to explain what the term antagonistic meant in **(a)**. A number offered no response at all while others named muscles from the upper arm. Few candidates appreciated that the general features of all reflex actions are that they are rapid and involuntary and instead described the pathway for a nerve impulse in a general stimulus and response situation. A frequent feature mentioned by candidates was that the brain is not involved and candidates should be aware that the brain is the coordinator for cranial reflexes such as the iris reflex and blinking of the eyelids. Despite the information in **(b)(ii)** about the severing of the spinal cord very many suggested that this reflex in the legs would be coordinated in the brain. In **(c)** most realised that the relevant hormone was adrenalin and most offered at least one change that occurred when adrenalin was released in emergency situations, very few could offer three correct responses.

Question 9

In **(a)(i)** many candidates identified Y and Z as the cytoplasm and vacuole, although chloroplasts were often given as the former despite their absence from the diagram. Few however were able to adequately describe how the hair like extension of the cell increased the surface area for absorption of water and mineral ions in (**ii)** while in **(iii)** many candidates stated that an animal cell would not have chloroplasts as the root hair cell does. Unfortunately the root hair cell, in common with all cells in roots, have no chloroplasts and this suggests that candidates, as in **(a)(i)**, did not look at the diagram carefully enough. In **(b)** the definitions of osmosis often omitted reference to the partially permeable membrane without which osmosis will not occur. There were candidates who suggested that the water movement was from the lower water concentration to the higher. Candidates must make it clear, when referring to the concentration of solutions whether they are describing the concentration of the solvent or the solute. Very few candidates were able to link osmosis in general to the particular case and equate the higher water concentration to the soil water and the lower concentration to the cell sap with the cell membrane being partially permeable. In fact, a significant number thought the permeable nature of the cell wall was a more important factor than the nature of the cell membrane.

Question 10

In **(a)**, candidates showed far better knowledge and understanding of the role of the xylem compared to that of the phloem. They should appreciate that phloem tissue transports sugars and amino acids in solution between the leaves, or storage structures, and the rest of the plant. Most understood that xylem transports water and mineral ions from the roots to the rest of the plant. References to other functions of these tissues, such as support by the xylem, were not relevant in this response. Responses about the structure of arteries and veins were needed in **(b)** and thus reference to what they transport and their origin, or destination, did not gain credit. Many candidates identified the presence of valves in veins and explained their role, while others referred to the thicker, more muscular walls of arteries and their narrower lumens but did not relate this to resisting the high blood pressure or maintaining it. Candidates should be aware that when a question requests differences between two structures the responses should cover both structures or should be dealt with using comparative terms. An example of this in **(b)** would be that “arteries have a narrow lumen while veins have a wide one” or ”arteries have a narrower lumen than veins”.

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

BIOLOGY

Paper 0610/31

Extended Theory

General comments

The paper offered a good range of questions which discriminated well between the candidates. Questions possibly demanded more thought, rather than recall of information, compared with recent papers. The extended questions were areas where the better candidates shone but the large number of low mark questions made sure that everyone was able to show what they knew. The range of marks was good with very few single figure marks. It was very pleasing to see that the calculations were done correctly by most candidates. **Questions 1 (c)**, **2 (a)**, **(b)** and **(f)(i)**, **3 (a)** and **(b)**, **4 (a)** and **5 (a)(iv)** were almost universally answered correctly. Completely correct answers gaining full marks were rare for **Questions 1 (d)(ii)**, **2 (e)**, **3 (b)(ii)**, **3 (c)(i)**, **3 (d)(iii)**, **4 (c)(iii)**, **4 (d)** and **5 (c)(ii)**. Weaker scripts had many gaps or wild guesses especially in **Questions 3 (b)** and **5 (c)**.

The overall performance of the candidates was similar to that of previous examination sessions. Mostly spelling was reasonable, although in some scripts the spelling of words such as chlorophyll, specialisation, optimum and potassium was a bit wayward, although usually recognisable. Of more concern was the number of scripts with poor handwriting which made it very difficult for Examiners to decipher.

There did not appear to be many problems with candidates finishing the paper. Where there were gaps, they seemed to be in very specific places, such as the calculation questions, the questions on fermentation in **Question 3** or some of the latter parts of **Question 5**. Many candidates did not use the correct key words in their answers. An example is the inclusion of the word *muscle* in the answer to **Question 5 (b)(i)**.

Many candidates ran out of space for their answers or crossed out their answers and rewrote them. Candidates are strongly recommended to indicate very clearly where continuation or rewritten answers are to be found so that Examiners realise this when they start marking individual questions. Candidates should make it clear on the left hand side of the page where the Examiner will find a continuation answer or a rewritten answer.

There were some examples of candidates giving detail considered unnecessary at this level. Some wrote about pyruvic acid and gave the structural formula of lactic acid in **Question 5**.

The Examiners were pleased to see a wide range of endangered species used in **Question 1 (e)**. However, there were many candidates who gave *groups* of animals as their answer, such as whales or seals. It was decided not to credit these examples unless all, or almost all, of the species within each group are endangered. It was noticeable that few plant species were given as examples and often 'trees' was used incorrectly.

This report should be read in conjunction with the mark scheme as in several places individual marking points are identified by numbers.

Comments on specific questions

Question 1

This proved a relatively straightforward opening question, although some candidates found it difficult to respond to parts of the question. Often they did not know how to respond in **(e)**, even though there have been similar questions on recent papers. However, some candidates did used examples, such as wild dogs, from recent papers. Some did not give a simple definition of the term *development* in **D (ii)**.

(a) Most candidates were able to give one correct answer here. Common correct answers were 'shell', 'muscular foot' and 'unsegmented'. Although not expected at this level the mark scheme includes 'mantle/mantle cavity' and 'visceral mass' and at least one candidate gave the latter. Few candidates gave 'gills'. Weaker candidates tended to give 'shell' and the vague 'slimy body' or 'slimy foot'. Weaker candidates referred to the shell as an exoskeleton and some gave features of arthropods or insects, such as antennae. Anthers were seen on a few scripts.

(b) There were many correct answers here as candidates spotted the key word *name* in the question. Most referred to the order of the names in the binomial or the lower case letter that starts the trivial name or specific epithet (see page 27 of the 2008 Syllabus). Some candidates referred only to the generic name and did not gain a mark. Some reversed the order of the specific and generic names stating that the species name is the first one. It should be pointed out that the binomial is the name of the species and it is more correct to refer to a species by its generic **and** specific names.

(c) This was a very straightforward question and most candidates gained two marks for identifying sexual reproduction and gave gametes or fertilisation in their explanations. However, some candidates thought this must be asexual reproduction yet still referred to gametes and fertilisation. In this case they lost both marks. A smaller number of candidates gave a form of nuclear division as their answer and although candidates knew that meiosis occurs in sexual reproduction the Examiners did not credit this answer. Candidates should know that 'a sexual' will always be interpreted as 'asexual'.

(d) Many answers were correct in **(i)** as almost all related the advantage to oxygen supply. However, some candidates implied that they thought the oxygen came from the host's gills as they wrote 'oxygen from gills'. They probably did not intend to mean that the oxygen diffused from the blood in the gills into the mussel, but that is what they wrote and so did not gain credit. A substantial minority wrote about air not water and a few seemed to think that the fish 'respired for the mussel'. Some implied that there was a parasitic relationship and a mark was awarded if they stated that the mussel could feed on the blood in the gills, although few did. Those who mentioned protection rarely qualified it by referring to predators and so did not gain a mark. A few stated that the mussel would gain a good supply of food as the water travels across the gills. Most of the answers in **(ii)** were too vague. Good answers were either simple definitions that referred to complexity or more involved answers involving differentiation of cells and formation of tissues and organs. Many candidates wrote about growth and/or maturity: 'grows to adult and gets bigger and matures to its full size' is an example of a common answer that did not gain credit. Many candidates seemed to think that growth and development are one and the same process.

(e) This question prompted a wide range of endangered species, mostly animals. The most popular were the big cats, elephants and rhinoceroses, although candidates from some countries showed good local knowledge giving species such as the Komodo dragon, the kiwi, the tuatara and the kakapo. Weaker answers were whales, seals and fish. Even though some whales, seals and many fish species are endangered, the Examiners did not give marks for answers that gave these groups of organisms. However, they did award marks for the conservation methods if they were appropriate to that type of animal. Most gave at least one suitable method, better candidates giving three or four. Most popular were reserves, methods to limit or ban hunting and/or poaching. Some candidates did not understand the question and thought that either the mussel or the fish was threatened and needed protection. The Examiners were surprised not to find gorillas or orang-utans offered as endangered species and it was very rare indeed to find any plant species.

Centres can find details about endangered species at the web site of the International Union for the Conservation of Nature (IUCN):

http://www.iucn.org

The Examiners used the IUCN Red List to check on the status of some species. Any that were in the categories of vulnerable to extinct in the wild were credited. Further details of the search facility are available at:

http://www.iucnredlist.org

A suggested approach would be to use the Red List to choose two or three species and set candidates the task of researching the category into which the species are placed and the specific conservation methods employed.

Some Examiners thought that as this topic appears at the end of the syllabus few had covered it in enough detail.

Question 2

This was a fairly straightforward question which prompted some good quality answers especially to **(f)**.

(a) A few candidates must have missed this question as they did not draw anything on the graph, yet answered (b). Most of the bars were in the correct place, were shaded correctly and followed the convention used for the other bars so there was the same space between them and those either side. Some reversed the shading or left the bars unshaded and so lost a mark.

(b) Almost all candidates identified the crops correctly as sugar beet in **(i)** and wheat in **(ii)**. Some misunderstood the question and gave figures, especially in **(ii)**. No marks were awarded for this type of answer, although some gave both the figures and the crop and so gained credit.

(c) The Examiners gave marks for identifying aspects of modern technology and further marks for some detail. Most candidates listed three aspects, such as an example of machinery (tractors and harvesters were commonly cited), pesticides, irrigation, greenhouses and genetic modification so gaining full marks. Others gave good further detail of one or more of these aspects and may have gained one or more of the marks. However, there were very mixed answers to this question. Most candidates could give two factors but did not give sufficient explanation to gain a mark for the further detail. The Examiners saw some excellent accounts of conditions that are controlled in greenhouses. Answers about machinery were often vague as they stated that better machinery is used or better tools without specifying what these might be. Selective breeding was often given and supporting detail occasionally referred to incorporating features such as hardiness, drought resistance, pest or disease resistance in a high yielding variety. Genetic engineering was also given although often accompanied by details of how it would be done rather than any advantages in terms of yield. There seemed to be little understanding of the advantages of GM crops. Weaker answers tended to deal with improving the soil and crop rotation that are traditional methods rather than modern.

Centres should note that the term *pesticide* is used to cover insecticides, fungicides, molluscicides and other chemicals used to protect crops against pests, diseases and competitors. The Examiners usually saw it used in its more restricted sense of chemicals used against animals that eat crops, such as insect pests.

(d) This question was not well understood as most answers stated something like 'dry is better because it's what is actually produced, while fresh mass has water which is not part of the crop but has mass'. Few candidates identified the fact that the mass of water in the crop fluctuates, although some did refer to absorption and transpiration in this context and usually gained the mark.

(e) The Examiners were surprised how few did not make the point about energy loss between trophic levels. Many tended to say that the maize had more energy than the cow, without saying anything about energy loss. They were not clear that the loss of energy is between the whole trophic level and the whole of the next level. The difference in energy per unit mass of beef and maize was irrelevant to answering this question. Candidates from some Centres explained the 10% rule very well indeed explaining that if the energy available in the maize crop was 100 units, then only 1 unit would reach humans as secondary consumers. However, there was not a mark for further explanation to reward these answers. Candidates who realised that they should concentrate on the primary consumer trophic level often mentioned loss of energy by the cow as heat, by movement and as a result of respiration. Some candidates saw this question not in terms of energy, but the quality of the nutrients. They thought that the quality of the nutrients in the maize was better than that in the cow. These candidates would have been helped by the use of the word *energy* in the question. A few concentrated on ideas such as maize being less expensive than meat or the number of people that could be fed by either food substance.

(f) In most cases there were good answers to this question. Most candidates completed the equation correctly in **(i)**. The most common error was to give CO_2. In some cases poor handwriting made it hard to decide whether the candidate had written $6O_2$ or CO_2. Most candidates got at least one, often two, features in **(ii)**. The most common were large surface area and chloroplast or chlorophyll. 'Clorofyl' was a common misspelling. A few gave transparent epidermis and a description of the leaf mosaic. Water potential was not well understood in **(iii)**, although there were

a number of definitions which gained credit if they were linked to roots. Many candidates referred to the water potential of the plant. Most referred to 'roots' and not root hairs and 'concentration gradients' of water rather than water potential gradients. Osmosis was often mentioned correctly, but if linked to poorly understood ideas of water potential gave rise to biologically incorrect statements. Candidates who stated that water is absorbed by active transport as well as by osmosis did not gain the third marking point.

This type of answer was very common:

'Water goes from a high water potential where there is not much water to a low water potential with a lot of water against the concentration gradient by osmosis.'

Candidates who tried to explain about transpiration effects often got confused and referred to the xylem sucking the water out of the soil. The Examiners did not award any marks for answers that dealt with transpiration. Centres should note that candidates taking this paper should **not** be taught to write about 'water concentration'. Most candidates gained their two marks in **(iv)** by stating that carbon dioxide diffuses through the stomata. Some good quality answers that dealt with the movement of carbon dioxide from the atmosphere to the photosynthetic cell in detail did not gain any extra credit which they deserved for displaying such good understanding. A common error was to state that guard cells let in carbon dioxide without referring to stomata. Some candidates mentioned the carbon dioxide released from respiration. Lengthy answers about photosynthesis were unnecessary here.

Question 3

Candidates tended to score very well on the first part of the question which dealt with nutrition and health. They were often less sure of the details of the fermentation process in the latter part of the question.

(a) Almost all candidates gained two marks in **(i)** by giving direct comparisons using 'more' or 'less' in their answers. Very few used the figures in support of their answers. Fewer were successful in **(ii)** although they gave the two correct factors – the presence of fibre and less fat. Some identified more carbohydrate but there is no health benefit from that. Explanations were more varied and some were very vague such as 'cleaning the colon'. The idea of 'risk' was not well explained as it tended to be written in this form: 'you will be…' which the Examiners allowed although they would prefer candidates to appreciate that this is not strictly a correct expression. Weaker candidates tended to write 'not getting too fat' and 'no heart problems' which did not match the mark scheme. For fibre a common vague answer was 'helps digestion'. Candidates often wrote about excretion when they were referring to defaecation.

(b) Most candidates gained both marks in **(i)** while weaker ones tended to do the addition without further processing. Incorrect answers were either addition errors or dividing the total by 100. Quite a few candidates had the right idea in **(ii)**, although possibly more by luck than judgement as many tended to put the same answers for **(c) (i)** and it depended upon which one was first. 'Vitamins' and 'minerals' were more common than specific examples. The most common error was to give 'nitrates'. Water was another common error.

(c) Part **(i)** prompted a greater variety of answers, more often wrong than right. More candidates gave a complex source such as protein, starch or fat or just 'carbohydrate'. Methane and waste from the food industry were sometimes given possibly showing some confusion with single cell protein production by bacteria. Very few candidates gained two marks here. Many candidates gave the idea of 'filter' or 'filtration' in some form or other in **(ii)**. Most gave the correct answer in **(iii)**; the most common incorrect answer was methane, although the Examiners also saw oxygen, nitrogen and carbon monoxide.

(d) In **(i)**, few candidates gave one temperature within the range 20 ^{o}C to 30 ^{o}C which the Examiners thought appropriate as the actual temperature for this fermentation is 24 ^{o}C. Most candidates gave body temperature (37 ^{o}C) or the range 35 to 40 ^{o}C. To gain the mark candidates had to give both the degrees sign and a capital C. Better candidates gained both marks in **(ii)**; others got the idea of heat release from chemical reactions but did not specify respiration, fermentation or metabolism. Many wrote exothermic which was good to see. Some clearly had no idea and wrote about hot air rising within the fermenter and hot water in the water jacket to start the reactions. Also quite a number stated that the heat came from the motors of the stirrer. A few turned the question on its head and wrote 'because it needs a high temperature'. Answers to **(iii)** were poorly expressed in

most cases. They were often too vague, for example, to stop denaturing or prevent it slowing down without giving any indication of high or low temperatures. Alternatively, high *and* low temperatures were said to kill fungi or denature enzymes. Most gained one mark either for the idea of having an optimum temperature or for preventing the temperature going too high and denaturing enzymes. There was a significant number who suggested that the fungus denatured or that enzymes were killed. Better candidates gained a mark in **(iv)** by identifying the circulation of water in the water jacket as the way in which the temperature inside the fermenter is kept constant. The Examiners saw many answers where the function of the water jacket was described very well without being identified by name; they decided at an early stage only to credit these answers if the term *water jacket* appeared in the answer. They reasoned that there could well be a range of vague answers to this question; for example, weaker answers referred to adding cold water and removing hot water from the fermenter without explaining where this happens.

Question 4

This question seemed to give candidates the greatest problems. The Examiners saw many blank answers especially for **(d)** where it was clear candidates did not know anything about gonorrhoea.

(a) Most candidates gained both marks in one or other combination, most commonly for stating the first and second points on the mark scheme, or the second and fourth. Some candidates referred to fertilisation which was not appropriate here.

(b) Most candidates gave an appropriate term for the method of birth control. Common incorrect answers were artificial, chemical, contraception and family planning. Most gained a mark in **(ii)** by referring to fertilisation. Candidates lost marks by stating that the sperm were heading for the 'ovule' or the ovary. Some stated that the sperm move towards the oviduct and this did gain credit. Most however, stated that the sperm are prevented from entering the vagina or cervix or are trapped in the end of the condom. Some stated that using a condom prevents sperm leaving the penis or stops sperm being released in the uterus. Neither of these answers gained credit.

(c) Answers to **(i)** were often difficult to disentangle and often very general. The points covered by marking points 1 and 3 often tended to merge in the answers and it was not always clear where HIV was carried. Many did not refer to semen as the vehicle; it seemed to be a common idea that sperm carry the virus although this could be that some candidates found it difficult to express this idea. They should however know the distinction between sperm and semen. Another common idea was that contact of penis and vagina was the critical factor, not the mixing of fluids. Very few candidates gained both marks. The idea of increased risk, or more unprotected sex, for marking point 4 was not common nor a clear idea that an infected person passes the virus to another person for marking point 2.

Most candidates gained one mark in **(ii)**. The answers were often too imprecise: using dirty or unsterilised needles was more common than the idea of sharing needles as happens between intravenous drug users. Most did not give the drug user link, but the Examiners accepted 'sharing needles' as the minimum acceptable answer here. The most common answer referred to the mixing of blood, for example between two people with open wounds. 'Touching the wound of an HIV person' is not an acceptable answer as it needs to be made clear that there is blood contact and the person who becomes infected must have an open wound. Needle stick accidents that happen to medical staff are worth remembering as an unfortunate means of transmission. 'From mother to fetus' or 'from mother to baby', 'born with HIV', 'inherited from mother', 'mother gives it to baby' were also common but vague answers that did not gain credit. Many missed the mark for blood transfusion by referring to blood transfer. Oral sex was not credited as that was thought to be excluded by the question. The Examiners were most concerned that many candidates gave completely inappropriate answers, such as:

- kissing
- through saliva
- touching infected blood
- drinking water
- toilet seats
- sharing food, drinks bottles, cups and plates
- using a sharp object – without any reference to blood
- inherited from parents (many thought the virus is carried in the sperm and is passed to the next generation at fertilisation).

Transmission of HIV seems to be an area that Centres should make sure is more thoroughly understood.

Part **(iii)** was much more challenging. Answers were generally poor as most only referred to white blood cells without being more specific. The Examiners expected candidates to explain that the HI virus enters lymphocytes and then detail the consequences of this. Some answers were excellent, but many did not end with the phrase that the immune system cannot 'fight off' disease. The link between lymphocytes, antibodies and phagocytes was not always made clear. Many candidates probably had the right idea, but did not know the right words to match the requirements of the mark scheme. Some candidates, however, were good at expressing the idea of susceptibility to disease or infection although some said that they would be more exposed to infection which is not the case. On the other hand very few explained that existing immunity to diseases would be reduced. Most dealt with the failure of the immune system to control HIV. This was not required to answer the question. Centres should note that candidates did not gain credit for the phrase 'fighting disease'. However several Examiners reported reading excellent accounts of T cells and their role in immunity.

(d) Quite a number of candidates did not answer any part of this question. Some answered one part but left the rest blank. In **(i)**, there were many sores, spots, rashes or itches in a variety of vague places rather than sores or ulcers on the penis or in the vagina. There were also many unqualified discharges and again they did not gain credit either. The Examiners credited answers in **(ii)** that could have appeared in **(i)**; as in **(i)** there were many discharges and pains but not localised to an appropriate part of the body. 'Difficulty in urination' was not awarded a mark as it did not convey the idea of pain. The better candidates gave sterility and a few referred to blindness but not always to the child of a mother with gonorrhoea. Almost all that attempted **(iii)** gave antibiotics or penicillin. Weaker candidates confused this with other STDs so that fungicide creams, insect powders and 'no cure' were given; so was the vague 'medication prescribed by the doctor'. Penicillin is no longer used to treat gonorrhoea but the Examiners did award this a mark. Antibiotics such as ciprofloxacin are used now.

Question 5

This question posed several challenges to the candidates. Well prepared candidates read the questions carefully and responded with the appropriate detail. Part **(c)(ii)** was worded in such a way that candidates had to justify their answers and this proved difficult. They were also short of space and could have done with more lines.

(a) Answers to **(i)** were generally inaccurate as candidates referred to differences in energy required or used, rather than the time taken to deplete energy stores. Very few made use of the data to give a numerical answer. Better answers spotted that energy reserves lasted four times as long when walking as with running. Better candidates gave correct answers in **(ii)** which were blood glucose and muscle glycogen. Most however, gave liver glycogen rather than muscle glycogen. A large minority gave skin fat. Most underlined fat and carbohydrate in **(iii)**, although quite a number gave protein instead of fat. The majority gave the correct answer in **(iv)** with very few rounding their answers incorrectly. Common errors were to work out each separately and add the two values together, or to use the wrong data and divide 48 by 4.

(b) Only the better answers referred to muscle in **(i)**; very few related the consumption of protein with muscular growth. Most answers tended to be either a general description of tissue repair or growth or the use of protein as an energy source. The Examiners did not credit answers that referred to 'strengthening of muscle'. There were also very few good answers to **(ii)**. Better candidates had the idea of an energy store, but glycogen was rarely mentioned or the site of the store. There were very few answers that dealt with the conversion of carbohydrate to fat. Many referred to carbohydrate loading but this was described as 'stocking up' on carbohydrates or storing carbohydrates rather than energy. Weaker candidates stored glucose in the blood. Some thought that it takes three days to digest carbohydrate.

(c) There were very few correct answers to **(i)**. All sorts of formulae were given with ethanol being more common than variations of lactic acid. The most common incorrect formulae were C_3H_4COOH and $C_4H_6O_2$. Many wrote a correct word equation, and often had a go at writing a chemical equation as well but did not write this accurately. The correct equation for aerobic respiration was often given suggesting that the equation for anaerobic respiration in mammals is not known. It was rare to see more than one or two marks in **(ii)**. This was a challenging question because of the way it was phrased. Candidates had to justify the use of anaerobic respiration by sprinters rather than just state that this is what they do. Marking points 1 and 5 were the most common. It was often difficult for the Examiners to separate marking points 1 and 2 in some scripts. Better answers linked oxygen supply (marking point 3) to lactic acid production (marking point 5). Very few specified that anaerobic respiration does not require oxygen (marking point 4). Poorer answers also tended to say that the marathon runner needed oxygen and the sprinter did not with no link to respiration. Answers referred to 'fast and slow' running and sprinters using more energy than marathon runners. Many also referred to sprinters 'not breathing' and as result having an oxygen debt suggesting a misunderstanding of the oxygen debt. This question, more than any others, required a high degree of fluency in English.

It was difficult to give marks in **(iii)** as the Examiners required candidates to make it clear that the source of glucose is the liver. Some candidates assumed it was the liver from the question and tended not to say it. Weaker answers tended to merge marking point 1 with marking point 3 for example by saying that glycogen stores are converted into blood sugar. Glucagon was often stated to 'break down' glycogen which it does not. Candidates should know that glucagon is a hormone and stimulates the liver to breakdown glycogen to glucose. Many referred to insulin rather than glucagon. The concept covered by marking point 4 was rarely stated clearly as most wrote that the blood glucose is used so the liver glycogen 'goes down'. Some candidates thought that glycogen was released into the blood to maintain the glucose concentration.

BIOLOGY

Paper 0610/32

Extended Theory

General comments

The paper offered a good range of questions which discriminated well between the candidates. Questions possibly demanded more thought, rather than recall of information compared with recent papers. The extended questions were areas where the better candidates shone but the large number of low mark questions made sure that everyone was able to show what they knew. The range of marks was good with very few single figure marks. It was very pleasing to see that the calculations were done correctly by most candidates. **Questions 1 (c)**, **2 (b)**, **(c)(ii)** and **(d)(i)**, **3 (a)** and **(b)**, **4 (a)** and **5 (a)(iv)** were almost universally answered correctly. Completely correct answers gaining full marks were rare for **Questions 1 (d)(ii)**, **2 (a)**, **(d)(ii)** and **(e)**, **3 (b)(ii)**, **3 (c)(i)**, **3 (d)(iii)**, **4 (c)(iii)**, **4 (d)** and **5 (c)(ii)**. Weaker scripts had many gaps or wild guesses especially in **Questions 3 (b)** and **5 (c)**.

The overall performance of the candidates was similar to previous examination sessions. Mostly spelling was reasonable, although in some scripts the spelling of words such as chlorophyll, specialisation, optimum and potassium was a bit wayward although usually recognisable. Of more concern was the number of scripts with poor handwriting which made it very difficult for Examiners to decipher.

There did not appear to be many problems with candidates finishing the paper. Where there were gaps, they seemed to be in very specific places, such as the calculation questions, the questions on fermentation in **Question 3** or some of the latter parts of **Question 5**. Many candidates did not use the correct key words in their answers. An example is the inclusion of the word *muscle* in the answer to **Question 5 (b)(i)**.

Many candidates ran out of space for their answers or crossed out their answers and rewrote them. Candidates are strongly recommended to indicate very clearly where continuation or rewritten answers are to be found so that Examiners realise this when they start marking individual questions. Candidates should make it clear on the left hand side of the page where the Examiner will find a continuation answer or a rewritten answer.

There were some examples of candidates giving detail considered unnecessary at this level. Some wrote about pyruvic acid and gave the structural formula of lactic acid in **Question 5**. Many misinterpreted what was required in **Question 2 (a)** where they were asked to describe the experimental procedure. They were also confused about the roles of the different bacteria in the nitrogen cycle in **Question 2 (e)**.

The Examiners were pleased to see a wide range of endangered species used in **Question 1 (e)**. However, there were many candidates who gave *groups* of animals as their answer, such as whales or seals. It was decided not to credit these examples unless all, or almost all, of the species within each group are endangered. It was noticeable that few plant species were given as examples and often 'trees' was used incorrectly.

This report should be read in conjunction with the mark scheme as in several places individual marking points are identified by numbers.

Comments on specific questions

Question 1

This proved a relatively straightforward opening question, although some candidates found it difficult to respond to parts of the question. Often they did not know how to respond in **(e)** even though there have been similar questions on recent papers. Some candidates used examples, such as wild dogs, from recent papers. Some did not give a simple definition of the term *development.*

(a) Most candidates were able to give one correct answer here. Common correct answers were 'shell', 'muscular foot' and 'unsegmented'. Although not expected at this level the mark scheme includes 'mantle/mantle cavity' and 'visceral mass' and at least one candidate gave the latter. Few candidates gave 'gills'. Weaker candidates tended to give 'shell' and the vague 'slimy body' or 'slimy foot'. Weaker candidates referred to the shell as an exoskeleton and some gave features of arthropods or insects, such as antennae. Anthers were seen on a few scripts.

(b) There were many correct answers here as candidates spotted the key word *name* in the question. Most referred to the order of the names in the binomial or the lower case letter that starts the trivial name or specific epithet (see page 27 of the 2008 syllabus). Some candidates referred only to the generic name and did not gain a mark. Some reversed the order of the specific and generic names stating that the species name is the first one. It should be pointed out that the binomial is the name of the species and it is more correct to refer to a species by its generic **and** specific names.

(c) This was a very straightforward question and most candidates gained two marks for identifying sexual reproduction and gave gametes or fertilisation in their explanations. However, some candidates thought this must be asexual reproduction yet still referred to gametes and fertilisation. In this case they lost both marks. A smaller number of candidates gave a form of nuclear division as their answer and although candidates knew that meiosis occurs in sexual reproduction the Examiners did not credit this answer. Candidates should know that 'a sexual' will always be interpreted as 'asexual'.

(d) Many answers were correct in **(i)** as almost all related the advantage to oxygen supply. However, some candidates implied that they thought the oxygen came from the host's gills as they wrote 'oxygen from gills'. They probably did not intend to mean that the oxygen diffused from the blood in the gills into the mussel, but that is what they wrote and so did not gain credit. A substantial minority wrote about air not water and a few seemed to think that the fish 'respired for the mussel'. Some implied that there was a parasitic relationship and a mark was awarded if they stated that the mussel could feed on the blood in the gills although few did. Those who mentioned protection rarely qualified it by referring to predators and so did not gain a mark. A few stated that the mussel would gain a good supply of food as the water travels across the gills. Most of the answers in **(ii)** were too vague. Good answers were either simple definitions that referred to complexity or more involved answers involving differentiation of cells and formation of tissues and organs. Many candidates wrote about growth and/or maturity: 'grows to adult and gets bigger and matures to its full size' is an example of a common answer that did not gain credit. Many candidates seemed to think that growth and development are one and the same process.

(e) This question prompted a wide range of endangered species, mostly animals. The most popular were the big cats, elephants and rhinoceroses, although candidates from some countries showed good local knowledge giving species such as the Komodo dragon, the kiwi, the tuatara and the kakapo. Weaker answers were whales, seals and fish. Even though some whales, seals and many fish species are endangered, the Examiners decided not to give marks for answers that gave these groups of organisms. However, they did award marks for the conservation methods if they were appropriate to that type of animal. Most gave at least one suitable method, better candidates giving three or four. Most popular were reserves of some form or other and a method to limit or ban hunting and/or poaching. Some candidates did not understand the question and thought that either the mussel or the fish was threatened and needed protection. The Examiners were surprised not to find gorillas or orang-utans offered as endangered species and it was very rare indeed to find any plant species.

Centres can find details about endangered species at the web site of the International Union for the Conservation of Nature (IUCN):

http://www.iucn.org

The Examiners used the IUCN Red List to check on the status of some species. Any that were in the categories of vulnerable to extinct in the wild were credited. Further details of the search facility are available at:

http://www.iucnredlist.org

A suggested approach would be to use the Red List to choose two or three species and then set candidates the task of researching the category into which the species are placed and the specific conservation methods employed.
Some Examiners thought that as this topic appears at the end of the syllabus few had covered it in enough detail.

Question 2

(a) This question divided the candidates. Some thought that they had to *explain* the experiment while others used the information below the lines to describe how to calculate the energy transferred from the burning nuts. They often interpreted the question as 'what do you use these pieces of apparatus for?' and wrote statements such as 'use the known volume of water to measure the heat given off by the burning nut' and 'use the thermometer to see the change in temperature'. The rest described the experiment (which was the intention of the question), but often did not follow the correct sequence. The most commonly awarded marks were marking point 3 and marking point 8. Very few actually lit the nut in their descriptions and many took the temperature of the water after a certain interval of time, such as two minutes, instead of taking the maximum temperature reached.

The first answer was typical of those from candidates who took the first approach and gained no marks.

'If the groundnut had sufficient amount of energy, then when it has been put onto the fire, it should be able to remain burning for a certain amount of time, indicating how much energy it contains. The water in the boiling tube is placed on top of the burning groundnut so that the heat may bring it to a boil. The more heat there is, the higher the amount of energy produced.'

The following answer has six of the marking points and is well organised.

'1. Fill a boiling tube with 25 cm^3 of water measured using a measuring cylinder. (MP2)

2. Measure the initial temperature of the water using a thermometer. (MP3)

3. Pierce a groundnut which mass was measured by an electronic balance with a mounted needle. (MP1)

4. Place the groundnut directly under the boiling tube and set it alight. (MP4)

5. Leave the groundnut in that position until all visible pieces of the nut are burnt (i.e. no more brown colour, just charred black remains). (MP5)

6. Immediately measure the new temperature (MP8) and subtract from the initial temperature to find the increase in temperature.

7. Use the formula in **(b)** to find the energy released.

It is worth pointing out to candidates that this method is useless if the water boils.

(b) Most candidates gave the correct answer although some gave the incorrect answer and did not gain the mark for working as they had given incorrect values, usually 20 x 24 x 4.2.

(c) The majority did not label the axes of the graph in **(i)**. The point to be plotted (2520) lies between two grid lines on the graph. If candidates plotted the point on a line then they did not gain the mark. Some candidates extended the line beyond the points given and so lost the third marking point for the plot and the line. Almost all candidates gave a good description of the graph in **(ii)**. A few weaker candidates described the individual data points or just said 'it increases' without being more specific. Some referred to the graph as showing a positive correlation or directly proportional but without making it clear what they meant.

(d) Most of the candidates gained a mark for **(i)**. The most common error was not to multiply by 100. Almost all the answers were written out in full as 609 000; very few candidates used standard form such as 6.09×10^5 or 60.9×10^4. Part **(ii)** proved to be a good discriminator for the very best candidates. The only point made by most of the better candidates was heat loss to the surroundings. Some of these also gained the second marking point on the scheme by stating that there was incomplete burning or they stated that there was heat transfer to the tube or the needle, but not to the water. Most candidates gave standard experimental errors such as incorrect temperature readings or referred to faults with the apparatus or stated that there were no repeat readings. These answers were not credited.

(e) This was probably the question that attracted the poorest answers. The Examiners considered that there were two main ways in which the legumes would obtain nitrogen compounds and so arranged the marking points into two groups. The first group was concerned with the absorption of nitrate ions or ammonium ions from the soil. The second group of points concerned nitrogen fixation *within* the legume. Undoubtedly some nitrate in the soil will have been made available through the action of free living nitrogen fixers but this will be several steps away from absorption by the legume. Nitrogen fixed by free living bacteria and blue greens will not become available to legumes until the organisms have decayed and any nitrogen-containing compounds broken down to ammonia and then converted to nitrate by nitrifying bacteria.

Many knew that active transport is used to take up nitrate ions from the soil, but few mentioned root hairs or soil water. Most used nitrate to make protein rather than amino acids. A great many had muddled descriptions of nitrifying, denitrifying and nitrogen fixing bacteria; for example some stated that nitrogen fixing bacteria convert nitrogen to nitrate which is used by nitrifying bacteria to form ammonia used in the plants to make protein. Some stated that nitrogen fixation occurs in root nodules and then stated that the nitrate ions produced would be absorbed by root hairs by active transport. These candidates should know that nitrogen is fixed as ammonia and transferred to the host as ammonium ions or as amino acids.

Question 3

Candidates tended to score very well on the first part of the question which dealt with nutrition and health. They were often less sure of the details of the fermentation process in the latter part of the question.

(a) Almost all candidates gained two marks in **(i)** by giving direct comparisons using 'more' or 'less' in their answers. Very few used the figures in support of their answers. Fewer were successful in **(ii)** although they gave the two correct factors – the presence of fibre and less fat. Some identified more carbohydrate but there is no health benefit from that. Explanations were more varied and some were very vague such as 'cleaning the colon'. The idea of 'risk' was not well explained as it tended to be written in this form: 'you will be…' which the Examiners allowed although they would prefer candidates to appreciate that this is not strictly a correct expression. Weaker candidates tended to write 'not getting too fat' and 'no heart problems' which did not match the mark scheme. For fibre a common vague answer was 'helps digestion'. Candidates often wrote about excretion when they were referring to defaecation.

(b) Most candidates gained both marks in **(i)** while weaker ones tended to do the addition without further processing. Incorrect answers were either addition errors or dividing the total by 100. Quite a few candidates had the right idea in **(ii)** although possibly more by luck than judgement as many tended to put the same answers for **(c) (i)** and it depended which one was first. 'Vitamins' and 'minerals' were more common than specific examples. The most common error was to give 'nitrates'. Water was a common error.

(c) Part **(i)** prompted a greater variety of answers, more often wrong than right. More candidates gave a complex source such as protein, starch or fat or just 'carbohydrate'. Methane and waste from the food industry were sometimes given possibly showing some confusion with single cell protein production by bacteria. Very few candidates gained two marks here. Many candidates gave the idea of 'filter' or 'filtration' in some form or other in **(ii)**. Most gave the correct answer in **(iii)**; the most common incorrect answer was methane, although the Examiners also saw oxygen, nitrogen and carbon monoxide.

(d) In **(i)**, few candidates gave one temperature within the range 20 ^{o}C to 30 ^{o}C which the Examiners thought appropriate as the actual temperature for this fermentation is 24 ^{o}C. Most candidates gave body temperature (37 ^{o}C) or the range 35 to 40 ^{o}C. To gain the mark candidates had to give both the degrees sign and a capital C. Better candidates gained both marks in **(ii)**; others got the idea of heat release from chemical reactions but did not specify respiration, fermentation or metabolism. Many wrote exothermic which was good to see. Some clearly had no idea and wrote about hot air rising within the fermenter and hot water in the water jacket to start the reactions. Also quite a number stated that the heat came from the motors of the stirrer. A few turned the question on its head and wrote 'because it needs a high temperature'. Answers to **(iii)** were poorly expressed in most cases. They were often too vague, for example to stop denaturing or prevent it slowing down without giving any indication of high or low temperatures. Alternatively, high *and* low temperatures were said to kill fungi or denature enzymes. Most gained one mark either for the idea of having an optimum temperature or for preventing the temperature going too high and denaturing enzymes. There was a significant number who suggested that the fungus denatured or that enzymes were killed. Better candidates gained a mark in **(iv)** by identifying the circulation of water in the water jacket as the way in which the temperature inside the fermenter is kept constant. The Examiners saw many answers where the function of the water jacket was described very well without being identified by name; they decided at an early stage only to credit these answers if the term *water jacket* appeared in the answer. They reasoned that there could well be a range of vague answers to this question; for example, weaker answers referred to adding cold water and removing hot water from the fermenter without explaining where this happens.

Question 4

This question seemed to give candidates the greatest problems. The Examiners saw many blank answers especially for **(d)** where it was clear candidates did not know anything about gonorrhoea.

(a) Most candidates gained both marks in one or other combination most commonly for stating the first and second points on the mark scheme or the second and fourth. Some candidates referred to fertilisation which was not appropriate here.

(b) Most candidates gave an appropriate term for the method of birth control. Common incorrect answers were artificial, chemical, contraception and family planning. Most gained a mark in **(ii)** by referring to fertilisation. Candidates lost marks by stating that the sperm were heading for the 'ovule' or the ovary. Some stated that the sperm move towards the oviduct and this did gain credit. Most however, stated that the sperm are prevented from entering the vagina or cervix or are trapped in the end of the condom. Some stated that using a condom prevents sperm leaving the penis or stops sperm being released in the uterus. Neither of these answers gained credit.

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BIOLOGY

Paper 0610/04

Coursework

General comments

Most Centres are using between 8 and 10 tasks for coursework assessment, frequently involving photosynthesis, osmosis, enzymes, heart rate and germination. These all lend themselves to quantitative investigations which generate results for graphing and evaluation. Some also include tasks requiring candidates to observe and draw biological specimens, and these can make good C2 tasks.

It is important that Centres recognise the importance of constructing task-specific mark schemes. The syllabus provides generic criteria for different levels in each Skill, but it is up to the teacher to translate these into more specific terms so that they can be reliably and appropriately applied to a particular task. Candidates should not be given these task-specific schemes, but may be given the generic ones.

Teachers should mark the candidates' work as they normally would, writing in red ink on the work to show where mistakes or omissions have been made, or where a particular criterion has been reached. Some Centres also like to include summary sheets on which brief comments are made on each candidate's work, but these should never replace marking and comments on the work itself.

There are occasional indications in the work from some Centres of candidates working together, or indeed of whole-class involvement in some aspects of the work being assessed. For example, there may be such great similarities in the designs of the C4 experiments that it is clear that candidates must have had some help in arriving at their design. It is, of course, immensely valuable to use group work in helping candidates to develop skills. However, for assessment purposes they *must* work entirely alone, just as they would in a written examination.

An increasing number of candidates are using word-processing and graphing programmes to present their work. There is no problem with this, so long as the candidate is working in an environment where the teacher can guarantee that the work is the candidate's own and that no help has been given. The Moderators were also concerned that in a few cases it appeared that the candidate was thinking too much about the IT and the presentation and not enough about the content of their work. Handwritten original work, generated during the lesson, may well be a much better option in many cases than allowing candidates to take work away with them and work on it in their own time.

Centres are reminded that they are required to send evidence of C1 assessment with their coursework sample, even though candidates do not generate written work for this skill. Most do this by sending in copies of tick sheets that the teacher completed as the practical work was being carried out, sometimes also with brief comments on each candidate's performance in that task.

BIOLOGY

Paper 0610/05

Practical Test

General comments

This paper produced a wide range of marks with some candidates performing very well. It was noted that some of the observations and drawings were carelessly and inaccurately performed. This paper tests observational skills, which may be assessed by writing or drawing. If these are not carried out accurately, then marks will not be awarded, as there will be no evidence that the candidate had made appropriate observations during the test.

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. It should be noted that the Supervisor's Report form is now found in the Confidential Instructions document rather than as part of 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. Diagrams should be drawn to show specimens with an outline consisting of a single clear continuous line rather than a sketched line. Label lines should be ruled, touch the relevant structure and should not cross each other. On graphs, points should be clearly and carefully indicated with a small cross. Smooth lines should be drawn, with a ruler if appropriate. Similarly, with a bar chart all lines should be ruled and drawn accurately.

Comments on specific questions

Question 1

(a) This was a relatively low scoring part of the question, as candidates were required to state both the colour of the suspension and to indicate the presence of bubbles or froth to gain the mark. Many answers simply related to one aspect of the appearance. The colours 'brown' or 'yellow' were not credited as brown was not considered to be appropriate and the use of yellow could have implied confusion with the hydrogencarbonate indicator.

(b)(i) Most candidates were able to score at least one mark in this section. Most made a suitable comment relating to the hydrogencarbonate indicator but answers often neglected to comment on the change in appearance of the yeast suspension or to give a time reference.

(ii) Some very good and comprehensive answers were seen. One common error was to state that the yeast was acidic, rather than the carbon dioxide evolved or the resulting hydrogencarbonate indicator. Answers were expected to state that the yeast was respiring. Mention of respiration or fermentation without reference to yeast was not credited.

(c) This part of the question was not answered well. Some candidates did not read the question properly while others suggested impractical methods. Few stated the need to actually measure the correct volume of yeast suspension at the start. Many based their method on the change in volume of the yeast suspension, the measurement of the froth, a change in volume of the indicator or collecting the evolved gas in an airtight test tube. None of these methods was appropriate. Those who sensibly suggested the use of a gas syringe or an upturned measuring cylinder over water were able to gain some marks. Candidates were expected to suggest collecting the gas evolved over a fixed period of time and then to divide the volume collected by the time to give a volume collected per minute. While some suggested repeating the experiment, few stated that these repeats should be carried out under the same conditions as the original.

(d) (i) A significant number drew yeast cells that were not budding and therefore did not follow the instructions. On this occasion, however, a suitable 'non-budding' yeast cell was accepted. The quality of the diagrams was generally poor. Sketchy and indistinct outlines were common and the structures within the cell poorly drawn. Labelling was often imprecise. Some candidates obviously mistook the yeast cell for a bacterium while others tried to label chloroplasts or chlorophyll. Some drawings were unlabelled.

(ii) Most candidates were able to measure and record the distance XY correctly, although some strange measurements were recorded. Candidates were expected to include units. Magnification calculations were, however, poorly carried out in many cases. The most common error was to divide the distance XY by the corresponding distance on the candidate's drawing instead of dividing the corresponding distance on the candidate's drawing by the distance XY. Calculations should have shown dividing by 8.1 or 81, depending on the units the distance was measured in. Some had used totally different figures. Those who try to express magnification as a percentage need to include the units (%) in the answer. Answers were credited whether or not they had taken into account the original magnification of Fig. 1.2. Candidates should be encouraged to look at their answers critically. It was not unusual to see a drawing significantly smaller than Fig. 1.2 and a magnification calculated as less than 1. Had the candidate considered this, then it might have been recognised that an error had been made in the calculation.

Question 2

(a) (i) One mark in this section was awarded for indicating the same level of liquid in each of the two containers. Some candidates indicated no liquid in the container at all. The drawing of the eggs was also imprecise. It was not unusual to see correct statements in **(ii)** but incorrect positioning in **(i)**.

(ii) While the comments relating to the size of the eggs were normally relatively accurate, those relating to their positions in the liquid were frequently ambiguous. It was not unusual to see a statement that completely contradicted the diagram. Candidates often failed to describe the appearance of the surface membrane but instead described the qualities of the egg. Those who attempted to describe the appearance of the surface membrane often used 'rough' or 'cracked' for W2 as a comparison to 'smooth' for W1. These terms were not acceptable to describe the wrinkled appearance of W2.

(iii) Most candidates were able to make valid statements relating to W1 and W2. It was noted, however, that some candidates appeared to have muddled the two specimens and therefore gave totally incorrect descriptions.

(iv) The observed differences were due to differences in water potential inside the egg and the surrounding liquid. Candidates were expected to answer in terms of water potential, stating that water would enter or leave the egg by osmosis down the water potential gradient. A common error was to state that the salt or the solution would pass into or out of the egg. A significant number of candidates stated, incorrectly, that the egg in W2 was plasmolysed and others applied this term, also incorrectly, to the egg in W1.

(b) (i) The quality of the graphs was variable. Candidates are expected to make good use of the graph paper available. Many used a scale that did not extend to use the right hand side of the graph paper. Others did not use a scale that enabled easy plotting of the points. It was noted that some scales were chosen that did not allow all the points to be plotted on the graph paper and that others did not give a vertical (y axis) scale that went up in even increments. Some points were plotted carelessly and inaccurately and were therefore not credited. Lines of best fit were credited, as were lines ruled from point to point. Lines were often drawn freehand from point to point or sketched and these were not credited.

(ii) Candidates were expected to correctly read off their graph the point at which their line crossed the x axis. While this was the intention of most of the candidates, a significant number did not read the scale accurately or failed to give units.

(iii) This was not answered well, although some candidates seemed to know the principles but did not express themselves clearly. Examiners were looking for the idea of no **net** movement of water, but few candidates stated this. A few mentioned that at this concentration there would be equilibrium. The most common statement was the idea of the same water potential inside and outside the egg, although it was not always clear where the potentials or concentrations were.

(c) (i) Many candidates answered this part of the question well, being awarded full marks. As the term 'biuret test' had been given in the question, credit was not given for simply restating the question. Candidates were expected to use 'solution' or to state the chemicals involved. As the question had asked for the procedure, there was no credit for the expected results if protein was present. Most candidates wasted time and effort in giving these details, often without having given adequate information about the actual test. Some candidates seemed to think that biuret 1 should be added to sample C and biuret 2 to sample D.

(ii) The first row asked for the appearance of the reagent (i.e. biuret solution) before testing. Most candidates stated the appearance of the sample, which was incorrect. As sample D contained a higher concentration of protein than sample D, credit was only given for answers that reflected this. However, as the concentration in sample C was low, credit was given for a 'negative' observation as the colour could be quite easily missed.

(iii) A statement that related to both samples and reflected the results obtained by the candidate would be credited. Some failed to refer to both C and D. If it was clear that the candidate had not added biuret 2 to sample C, then a suitable conclusion could not be arrived at.

BIOLOGY

Paper 0610/06
Alternative to Practical

General comments

The whole range of marks from 0 – 40 were seen and some Centres had all candidates scoring high marks. The standard of expression in English was good. It seemed that candidates were able to attempt all of the questions and that there was sufficient time for the paper to be completed in the hour allowed. This paper was comparable to the paper for last year (November 2007) in terms of difficulty. All parts to the questions were answered well by candidates. There were parts of some questions based on investigative and planning skills (C4), which some candidates found difficult and perhaps require further practise. Their suggestions were credited wherever possible. Drawing skills were good; similarly plotting graphs.

Candidates should be made aware of the differences in responses that they should make when questions involve terms such as state, describe, suggest, or explain. One of the problems seemed to be candidates giving descriptions when explanations had been requested.

Comments on specific questions

Question 1

The question was based on the use of de-shelled eggs which had the egg membrane left intact to act as a partially permeable (semi- or selectively permeable) membrane. The egg represented a 'giant' cell in distilled water and in salt solution to illustrate the process of osmosis.

(a) (i) The table completion, based on comparison of the two eggs shown in Fig. 1.1, was attempted by most candidates. The common error was made by assuming that the egg in distilled water was normal in size. These candidates failed to realise that the contents of the egg had solutes within which meant that more water molecules would move into the egg so an increase in the size was inevitable after 2 days – the use of the term 'normal' was not appropriate. The position of the eggs in the beakers was described satisfactorily by comparing the diagrams. The third row in the table describing the external appearance of the egg was sometimes more difficult to put into words and a wide number of terms were considered. Textural changes e.g. firm, hard or soft, were ignored.

(ii) The explanation for the changes observed in **(i),** showed a wide variety of answers and discriminated between the able candidates who described the points clearly compared to those who were able to gain one or two marks or none. It was important that the direction for movement of water molecules was clear. In distilled water the water moved into the egg because of the diffusion gradient whereas in the salt solution the water left the egg because of the diffusion gradient. There was some confusion where candidates thought the salt solution was the acid which was used in the de-shelling process.

(b) (i) The results, from a similar investigation, were given in a tabular form to be plotted as a line graph. The axes were labelled but not scaled. Most candidates correctly used and scaled the axes involving a suitable scale for the 'y' axis of 10 small squares to equal 3, 4 or 5 % change in mass. There were a number of candidates who were not able to produce an even scale and simply evenly spaced the readings given in the table. The horizontal axis (concentration of salt solution, g dm^{-3}) was sometimes not scaled or only half the printed grid was used. The points were plotted accurately by most candidates and either a line of best fit or a ruled line to join the plotted points was completed. There were some freehand lines which curved inaccurately between the points. There were fewer histograms seen in this examination than formerly.

(ii) The point where the line crossed the x axis (zero change in mass) could only be read from a line graph, not a histogram. Many candidates read this point and included the units correctly. There were a surprising number of candidates who did not read the point accurately giving for example 20.2 g dm^{-3} instead of 22.0 g dm^{-3} or whatever was appropriate for the line drawn on the graph. There were some candidates who failed to give a numerical answer or gave 0.0 with the units.

(iii) The concept of a balanced state or one of equilibrium was often described by candidates but not always expanded to cover the idea of an equal movement of water molecules or that there was no diffusion gradient. It was unfortunate that many candidates misinterpreted the question and merely repeated the wording of the question.

(c) The descriptions of a suitable food test, to compare the protein content of a sample of the yolk and the white of an egg, varied widely. Some able candidates included detail so that it was easy to follow the sampling procedure, the actual testing process, the comparison of results, the comparison of colour intensity and the drawing of a conclusion. It was this level of planning that was expected in the answer. Although the biuret test was the appropriate food test listed on the syllabus – the use of the Millon's test or albustix were also allowed. Many candidates incorrectly described other food tests which were not for protein. It is the intensity of the end colour which is indicative of the concentration of protein, not the speed in which the colour develops. Some candidates tried to digest the protein using protease enzymes but did not use one of the food tests at all. The chemicals in the food test reagents were often quoted incorrectly.

Question 2

The respiration of yeast in an active culture was the basis of this question. The introduction described the apparatus used to test the gas released, changing the hydrogencarbonate indicator solution to a yellow colour.

(a) The explanation given by candidates was expected to mention the process of respiration or fermentation and to express the idea of carbon dioxide being released. The solution would become acidic causing the colour change in the indicator. Many candidates described this clearly and gained the marks. Unfortunately, many candidates thought that it was either the lactic acid that was formed by the yeast, or the alcohol, that caused the colour change.

(b) In this part of the question, candidates were asked to describe a quantitative method to determine how the volume of gas given off could be measured using an appropriate set of apparatus not the same as in Fig. 2.1. Many candidates attempted to describe at length a suitable apparatus, whereas a simple sketch was considered, if the means of collecting the gas was clear. An inverted container filled with water or a gas syringe would collect the gas and the volume could be measured. Allowing the gas to bubble through hydrogencarbonate indicator, as in the given qualitative method, was not adequate as it did not collect the evolved gas. The timing aspect was important and the use of a clock or stopwatch was considered. Controlling the temperature was seldom mentioned. This could be by submerging the tube containing the yeast culture in a water bath or suitable container. The idea of repeating the readings and calculating an average was mentioned in some descriptions. Similarly, an idea of using a control for comparison was noted in some accounts.

However, it was noted that many candidates did not write about experimental investigations with practical details but gave descriptions of yeast respiration and formation of products. This is an area where candidates need to express how investigations are planned with the means of carrying out experimental procedures.

(c) (i) Most of the drawings of budding yeast cells from the photograph shown in Fig. 2.2 were clear and in good proportion generally. Most candidates used clear outlines of the mature yeast cell and the bud, showing the cell wall and main contents with labels. No shading should be used. The size of most drawings were of equal size if not larger than the photograph. There were a few very small drawings. It was difficult to identify a few of the drawings as a representation of the photograph as these often incorrectly showed a typical textbook drawing of a plant cell or an animal cell.

(ii) The measurement for the distance between **X** and **Y** was usually correct and few candidates missed the units used for this measurement. In calculating the magnification of the drawing candidates failed to take into consideration the X5000 magnification by the photograph, although many were familiar with the formula for the working mark.

Question 3

(a) Most candidates correctly identified the three structures and labelled them on the photograph shown in Fig.3.1. Some candidates incorrectly identified a clear area (intercellular space) as cytoplasm instead of a shaded area around either a nucleus or a set of chromosomes. The label lines must extend precisely to the intended area shown on the photograph and not end short of it. A few candidates did not attempt this part of the question.

(b) (i) The location for such dividing cells to form gametes in plants was known to candidates who realised the question was on meiosis and not mitosis. There were a number of candidates who were confused and gave plant organs such as leaves, roots or stems.

(ii) The location for such dividing cells to form gametes in animals was known to candidates. There were more correct answers than in the previous question. Some candidates named the gametes rather than where meiosis occurred.

(c) Many able candidates answered this section correctly giving all the possible points clearly from the halving of chromosome number in formation of gametes to the introduction of variation in the resulting offspring. Others rephrased the words of the question 'to form the gametes' without explaining further the importance of meiosis.