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GCE

Edexcel GCE

Biology (8040/9040)

Biology (Human) (8042/9042)

This Examiners' Report relates to Mark Scheme Publication code: UA017363

January 2006

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Examiners' Report

Edexcel GCE
Biology (8040/9040)
Biology (Human) (8042/9042)

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January 2006

Publications Code UA017363

Contents

There were no candidates for 6106/01 T2 so there is no examiner's report for this unit this series.

* 6103/02 W1 Written alternative to coursework is only available to International centres.

6101 Unit 1 Examiners' Report

Maximum mark 60

Mean mark 32.8

Standard deviation 10.3

General comments
Questions 2, 4 and 7c were mark yielding. Questions 3b, 3c, 5c, 6c and 8b proved to be more difficult for candidates.

Question 1
Very few candidates gained full marks. It appeared that many were reluctant to place a cross against all of the responses for insulin because they assumed that at least one statement must be correct and therefore placed a tick in one of the boxes.

Question 2
Although over 30% of candidates scored full marks on this question others seemed less confident and appeared not to have performed these practical biochemical tests. One common error was a reference to the use of potassium iodide to test for starch. Another aspect was the number of times an incorrect spelling of Biuret appeared.

Question 3
In part (b) it was pleasing to see that many candidates could draw the ring structure of glucose and could also correctly place the OH group on carbon number one. Far fewer could add the other OH groups correctly. In (b) lots of answers concentrated on the breakdown of starch during digestion rather than focusing on maltose itself.

Question 4
This question was generally well answered although in part (a) stage C was identified as anaphase. There was a lack of precision in answers to part (c) where many failed to refer to daughter cells being genetically identical to the parent cell.

Question 5
Part (a) was well answered although a number referred to energy production. It is pleasing to note that examiners were frequently able to award three or four marks for the drawing. The vast majority showed that they could draw to scale and many could also label the structures correctly. A sizeable number however, gave a 'text book' diagram of a mitochondrion rather than attempting to draw the specific mitochondrion shown in the photograph. In part (c) many referred to magnification rather than resolution. Very few were able to gain both available marks here.

Question 6
In (a)(i) there were many good answers. Some candidates struggled to deal with negative numbers but could still show they had an understanding of water moving from an area of higher water potential to an area of lower water potential. In (a)(ii) the fact that pure water has a water potential of zero was well known. Fewer candidates appreciated the effect of solutes on water potential values.
In (b)(i) many realized that the ions had moved against a concentration gradient but they did not refer to how the bar chart had allowed them to come to this conclusion. The majority of candidates successfully interpreted the bar chart and gained the mark in part (ii).

Question 7

Examiners commented on the huge variety of diagrams produced in part (a). There were some excellent diagrams but a large number of candidates having successfully drawn two nucleotides did not then know how to connect them together.

In part (b) a pleasing number of candidates correctly referred to hydrogen bonding between complementary base pairs and also referred to a double helix when describing DNA but far fewer were able to develop their answer from the structure of DNA to the structure of a chromosome.

The calculation in part (c) was correctly completed by over 70% of candidates but fewer knew which bases were purines.

Question 8

In part (a) (i) the majority of candidates clearly understood the advantages of immobilizing enzymes but a significant number did not choose advantages that were relevant to this particular example. In (a)(ii) few went beyond stating that not all of the lactose would be hydrolysed during the first passage through the column. References to kinetic energy and collision theory were absent or poorly expressed.

In part(b)(ii) a number of candidates were unable to calculate a percentage change while in part (iii) most could do no more than refer to active sites being full.

6102 Unit 2B Examiners' Report

Maximum mark 60

Mean mark 30.3

Standard deviation 8.2

General comments
This was considered, overall, to be an accessible Paper which gave candidates opportunities to show what they knew about this unit. The questions discriminated well between those candidates with some recall of information, and those with a good knowledge and understanding and an ability to apply their knowledge and interpret the information given.

In general, candidates coped well with questions 3(a)(i) and 3(b), 6, and 8(c), although there were also some irrelevant answers to 8(c). Questions which were less high scoring included 3(a)(ii), 4(b)(i), 5(b)(ii) and 7(c). In some cases, it was clear that candidates had not read the question carefully before attempting their answers, resulting in irrelevance. Accuracy and clarity of expression continues to be a problem for some; Examiners always expect candidates to express their answers clearly and unambiguously, using appropriate vocabulary.

Question 1
Most candidates scored good marks in this question, although the last line was frequently completed incorrectly. The Examiners commonly saw a number of instances where the answers were ambiguous hybrids between ticks and crosses, or boxes that had been left blank. Candidates must make their intentions clear to gain marks.

Question2
This was considered to be a very straightforward question, but a wide range of answers was seen. Although a number of candidates scored well and readily gained full marks, some answers were of a poor standard. In part (a), there were some accurate descriptions of the effect of mastication on food, correctly referring to mechanical digestion, mixing with saliva and the consequent facility of swallowing. However, some answers went straight into accounts of chemical digestion. Poor expression was evident here, with references to, for example, teeth breaking down food molecules. There were also some good, succinct, answers to part (b), with correct references to the effect of salivary amylase. Reference to glucose, as a product of starch hydrolysis by salivary amylase, was a common error here.

Question 3
Many candidates scored well in part (a)(i), usually by giving a description of the relationship between the percentage saturation of haemoglobin and the partial pressure of oxygen, and qualifying this with a suitable quantitative reference. Part (a)(ii), however, proved to be difficult for the majority of candidates. Although were many references to the relative size of mice and humans, few candidates interpreted the information correctly in terms of the relatively affinities of the two haemoglobins and consequent release of more oxygen by mouse haemoglobin at lower partial pressures. A number of candidates simply repeated the information given, without referring to the difference in affinity. Very few candidates correctly related the difference in size to differences in their surface area to volume ratio and the consequent effect on metabolic rate.

Part (b) was, however, more familiar to candidates, many of whom were able to give detailed descriptions of the mechanism of inspiration, which readily gained full marks. Some of the accounts were rather confused, but in general candidates described contraction of the diaphragm and the effects on volume and pressure within the thorax. There was sometimes

confusion between the external and internal intercostal muscles but generally candidates scored well here.

Question 4
Answers to part (a) were rather variable; the corpus luteum was generally better known than the other two structures. In part (b)(i), some of the descriptions were rather vague generalisations, but most candidates gained at least one mark for a reference to the decrease in the concentration of progesterone towards the end of pregnancy. Although many candidates correctly referred to maintenance of the endometrium in part (b)(ii), this was an instance where poor expression, or incorrect biological vocabulary, was evident in the answers. As examples, there were many references to the lining of the endometrium, or maintenance of the uterus wall.

Question 5
There have been a number of questions relating to adaptation to the environment and candidates' responses to these questions have steadily improved. However, one common difficulty is in the use of appropriate terminology to explain their answers. In part (a), the majority of candidates correctly identified appropriate features, but the qualifications of these were frequently rather poor. This was also the case in part (b)(i) where suitable features were suggested, but the qualifications of these were often inaccurate. Many candidates correctly suggested the presence of haemoglobin, or gills, and related these features to life in water with a low concentration of dissolved oxygen. Answers to part (b)(ii) were also rather variable and few candidates scored well for this part. Failure to read the question carefully seemed to cause problems here, as there were a number of explanations of the initial decrease in numbers. There were, however, some good answers that related the increase in numbers to an increase in the availability of dissolved oxygen.

Question 6
There were many good, detailed answers to this question which, in general, was high scoring. Many candidates correctly identified the tissue as epidermis in part (a)(i) and gave detailed descriptions of the pathways through the cortex in part (a)(ii). However, this was another instance of candidates not reading the question carefully as there a number of descriptions of movement of water through a leaf. Part (b) was often answered quite well and it was clear that many candidates were familiar with the use of a potometer.

Question 7
Virtually all candidates answered part (a) correctly, but part (b) proved to be more difficult. Relatively few correctly named the tunica media, and many of the answers to part (b)(ii) were confused and inaccurate. Although the question specifically asked about the role of collagen, many answers included descriptions of the artery wall in general, with references to elasticity and maintenance of pressure by elastic recoil. Part (c) also proved to be difficult for candidates to express their ideas clearly. Relatively few answers described the advantages of a double circulatory system but explained the meaning of the term. Some candidates correctly conveyed the idea of repressurisation of the blood and referred to the importance of maintaining different pressures between pulmonary and systemic circulations.

Question 8
In part (a), the prostate was better known than the seminal vesicle and relatively few candidates gained both marks here. Part (b) was usually answered quite well; references to the addition of an alkaline medium and providing nutrients for sperm were seen most frequently. The majority of candidates were able to gain some marks in part (c) and there were some good, detailed accounts that gained full marks. Nevertheless, there were also some irrelevant accounts of the process of fertilisation, rather than the transfer of gametes. Part (d) generally scored quite well and appropriate suggestions were given. The mark scheme included a range of possible causes of the changes in sperm counts, but some answers, such as references to changes in lifestyle or climate, were considered to be too vague. The majority

of candidates gained a mark in part (d)(ii). Occasionally, candidates failed to gain marks in part (d) as a result of describing the changes in (i), then suggesting a reason in (ii).

6112 Unit 2H Examiners' Report

Maximum mark 60

Mean mark 30.2

Standard deviation 8.2

General comments
This was also considered to be an accessible Paper, which seemed to discriminate well between candidates with limited recall of factual information and those with a good knowledge and understanding and an ability to apply their knowledge.

Questions 1, 2, 3, 4 and 8 were common with 6102, and the standard of answers was very comparable.

Questions answered well included 3 parts (a)(i) and (b), and question 8. Questions which seemed to cause difficulties for candidates included 5(a)(ii) and 7(a). Previous Examiners' Reports have referred to the difficulty that candidates have in describing the physiology of temperature regulation; this difficulty was again apparent in the answers to question 5.

Questions 1 to 4

Common with 6102

Question 5
In part (a)(i), the majority of candidates correctly named the sweat gland, but the other parts of the skin were less well known. In part (a)(ii), the majority of candidates correctly indicated that sweat glands secrete sweat, but the explanations of the cooling effect were frequently superficial and inaccurate. Very few candidates referred to changes in the rate of sweating in relation to changes in body temperature. Although some answers included references to latent heat, the context was often rather poor, suggesting that candidates did not really understand how the evaporation of water in sweat had a cooling effect. A number of answers included irrelevant accounts of changes in skin blood flow, or references to thermoreceptors.

In part (b)(i), the majority of candidates scored a least one mark for describing the trend; there were also some good, quantitative references or comments about the variability of the data. In part (b)(ii), most candidates appreciated that body fat has an insulating effect and so reduces heat loss. Relatively few candidates, however, accurately related differences in the percentage of body fat to core body temperature.

Question 6
The majority of candidates knew the function of soda lime and answered part (a)(i) correctly. The answers to part (a)(ii) were, by comparison, rather variable. Some candidates gave good, detailed descriptions of the principle of a spirometer and how they would measure tidal volume. There were, however, some answers that were largely irrelevant, as they included only an explanation of the term vital capacity. References to breathing causing changes in the water level were seen on a number of scripts. Part (b) was considered to be very straightforward and yet the answers were very variable.

Question 7
Part (a) proved to be surprisingly difficult for candidates and few gained two marks here. Many answers referred to heart rate, heart sounds, or blood pressure, but without explaining the term pulse. Although a number of candidates correctly referred to pulses being felt in arteries, some answers referred to veins, or blood vessels in general. Part (b)(i) was, however,

often answered correctly as many candidates correctly read the values from the graph and calculated the difference. The answers to part (b)(ii) were quite variable; good answers referred to increases in heart rate or stroke volume, and the increased demand for oxygen by tissues. Some answers were rather vague, referring only, for example, to 'more blood being pumped round the body'. There were some good, comparative answers to part (b)(iii); the majority of candidates correctly referred to the increase in systolic pressure and the decrease in diastolic pressure, and stated that the diastolic pressure remains the same at rest and light exercise.

Question 8
Common with 6102

6103/01 Unit 3 T1 Individual Investigation Moderators' Report

Maximum mark 32

Mean mark 19.5

Standard deviation 5.3

General comments

In comparison with previous series the overall standard fell, though the proportions of candidates who obtained marks above 26 and below 12 remained constant. Planning and Implementing sections were generally well attempted, but the outcome sections, Analysing and Evaluating, limited candidates' scores.

A greater number of candidates offered standard 'text-book' exercises as investigations than in the past. Centres should be aware that these are unlikely to gain high scores. Hypotheses often lacked biological knowledge specific to the studies themselves, so that enzymes, leaves and plants, for example, were described in general terms, as were the effects of the variables investigated, such as pH and temperature.

Candidates, who carried out AS coursework for the first time, showed little advance on the standard expected at GCSE. Modified work often lacked improvement, since additional material usually consisted of more biology (which was not relevant) and more (unselective) graphs.

In the January 2005 Report, rules governing re-submission of coursework were made clear. Some Centres are still not following them. Essentially Centres who submit investigations from a previous examination series are not permitted to re-submit them, unless they contain new material. Without investigations being re-worked, marks from a previous session must be transferred to the current examination and candidates shown as 'Transfers' (T) on the OPTEMS. The moderator will not expect any coursework from them.

New work should contain additional data from which candidates can re-work Analysing and Evaluating sections. Centres must provide written evidence for the moderator on Record Cards, or within scripts, about specific sections that contain new material. Moderators' experience, from this and previous sessions, suggests that only where candidates re-visit the Implementing stage is it likely that higher marks will be attained.

It was noted that many candidates' marks were restricted because of both weaknesses in types of investigations undertaken and in skills linked to specific criteria. Higher marks would have been achieved if coursework had shown the following evidence.

Planning

- Investigative work rather than demonstration of well known facts and principles
- Slimmed down biological knowledge that focused on the variable stated in a hypothesis
- Pilot investigations that informed the main investigation
- A separate section on variable control

Implementing

- Sound tabulation

Analysing

- Selectivity in graphs. (Usually though not always a single graph)
- Evidence of data manipulation in the form of mean averages, rates and even initial rates (where appropriate)
- Trends and patterns that related specifically to candidates' graphical data
- Error (range) bars that showed the extent of variability within data

Evaluating

- Use of error bars to develop Parts (a) and (b) for an award greater than 4 or 5

  These bars should direct candidates to variability and precision of measurement as well as to reliability. They should also suggest ideas for further work that are related to the variable investigated rather than to new ones.

Administration

Record cards frequently carried inadequate information. These should carry a title of the investigation and must contain two signatures, that of the teacher supervising the investigation and that of the candidate. This revised Record Card is to be found in the most recent version of the subject specification and should be copied for each candidate.

For effective moderation of coursework, two things need to be in place before it is sent to moderators. First, Centres must ensure that there is sufficient annotation on each script to inform the moderator about the award of marks for each sub-section. Second, Centres must, where several teachers are involved, carry out internal moderation, so that there is consistency of marking across groups.

Treasury tags most effectively hold Coursework together. When each sheet carries a name, personal identifier and page number, it is always possible to identify the work of individuals. Candidates do generally identify their work in this way, but many Centres continue steadfastly in holding it together in pocket files or with paperclips, rather than with treasury tags.

6103/02 Unit 3 W1 Written Alternative Examiners' Report

International Only

Maximum mark 32

Mean mark 14.4

Standard deviation 5.3

General comments

The overall performance was rather better than in previous series. This was due to improved tabulation and descriptive skills in Parts (a) and (c) of Question 1. In Question 2, many answers suggested that previous question papers and mark schemes were the only resources available in order to answer Part (a). This approach did not reward candidates with many marks. It is, however, appropriate for Centres to use past papers not only to inform candidates of the types of questions set, but also to enable them either to discuss appropriate methodologies, or to try out a number of investigations based on the hypotheses suggested.

Question 1

(a) Many candidates obtained top marks for tables. Failure to do so was most frequently caused by title (no reference to leaves) or unit (no reference to mm^2) omission.

(b) This scored less well than (a). Graphs were frequently careless and often carried axis, scale, plotting and line errors. Candidates who drew freehand graphs rarely scored a mark for joining points, since most lines did not pass through them.

(c) Trends and patterns were frequently well described. References to the overall changes in area and to the specific points of change were often made. Conclusions were also well targeted. It was refreshing to see that many candidates scored full marks.

(d) Limitations were usually appropriate to this investigation.

Question 2

(a) It was rare to see a top mark for this part of the question. Either candidates understood the right approach, but lacked practical experience, or planned a textbook investigation on the effect of pH on enzyme activity, with some practical detail gleaned from past mark schemes. It was rare to find a script that combined both the idea of reversibility and sound practical technique. There were marked differences between Centres. Frequently scripts from some of them contained only limited information on immobilised enzymes or about quantitative methods of detecting glucose or reducing sugars. Many candidates scored from the first 8 points in the mark scheme, which did not require them to use the idea of reversibility. The other marking points were restricted to those who carried out a reversibility technique.

(b) This part scored very poorly. The mark scheme allowed candidates to score full marks even if their techniques were not quantitative. However, where qualitative methods were employed tables rarely matched the method suggested. Those who used quantitative techniques generally scored higher marks, but even here tables

often failed to match the method. Marks were obtained for graphical presentation, but only as a result of consequential error.

(c) As for (b) this scored poorly. Most limitations were not linked to the methods employed, but to a previous mark scheme. Consequently it was rare for candidates to score even a single mark. Many made reference to difficulties associated with measuring techniques. However, these were usually stated in terms of 'difficulty in end point determination', which was not relevant to the technique used. Further work gained higher rewards, though it was rare to see more than 2 relevant points in any script. The most common suggestions related to the use of different or free enzymes.

6103/03 Unit 3 Paper 03 Examiners' Report

Maximum mark 38

Mean mark 18.6

Standard deviation 5.5

General comments

This seemed to be a relatively straightforward paper where good answers were seen on all of the questions. There were relatively few scripts seen where candidates had not made any attempt to answer sections of the questions. As in previous examinations, some candidates do not read questions carefully and give irrelevant answers or do not express themselves clearly enough.

Question 1

In part (a), most candidates gave a correct response. Carnivore was not considered to be an acceptable answer since the question asks for the mode of nutrition in which organic material is obtained from the bodies of other organisms.

In part (b), most candidates gave a correct response. A wide range of suitable material was accepted although many candidates penalised their answer with reference to 'carbohydrates'.

In part (c), there were very few candidates who were able to give detailed accounts for all three structural features. The position of the eye socket and its significance in stereoscopic vision to judge distances was generally well-done. The descriptions of the types of teeth tended to be very superficial. Very few candidates gave acceptable descriptions of the shape of the canines or their position at the widest part of the open mouth. Most candidates gained one mark for a reference to stabbing, piercing or holding the prey. The descriptions of the premolars and molars often used terminology that could be confused with these teeth in a herbivore. For example, 'grinding meat' and 'interlocking ridges'. Some good descriptions of the action of carnassial teeth were seen.

Question 2

In part (a), relatively few candidates could give a simple definition of biomass. Many candidates refer to 'amount' rather than mass.

In part (b), the calculation was correct from most candidates; a wide variety of methods was accepted. Some candidates did not include the units in their answer.

Part (c), was done well by most candidates and there was a large number of clear, accurate accounts of the stages required related to the correct bacteria. Some candidates confuse the process of nitrification with nitrogen fixation. It should be noted that where candidates use chemical formulae or symbols, it is expected at this level that these are correct.

In part (d)(i), most candidates were able to gain some credit. However, candidates should be aware that comparisons must be made clearly. Some candidates were not careful enough in their descriptions of the first 2 or 8 day periods. For the first 2 days, the nitrate released is the same and not 'almost' or 'nearly' the same. Between day 2 and day 8, the release is similar or only slightly more at 15^{o}C and not the 'same'.

In part (d)(ii) relatively few candidates gained full credit. Most candidates were able to state that at 10^{o}C, the release would be insufficient or too slow. Only the better

candidates realised that the increase in release at 8 days at 15^{o}C would coincide with the germination or growth of the crop or referred to the likelihood that the nitrates released quickly at 25^{o}C might be washed away.

Question 3

In part (a), most candidates were able to quote a formula using acceptable symbols e.g. NPP = GPP – R. However, many candidates did not refer to a rate or biomass in their answers. References to the biomass being available for the next trophic level were often confused with statements that it would all pass on to the herbivores or primary consumers.

In part (b)(i), most answers gained full credit. Some candidates confused respiration and photosynthesis. Other candidates, who had not read the question carefully, stated that some light would miss the leaf.

In part (b)(ii), there were some very good answers although relatively few candidates gained full credit. Common misconceptions included references to 'energy being used for respiration' and 'some is incorporated into the secondary consumer's biomass as it grows'.

In part (c), very few candidates gave a correct response. Most candidates missed the point that the students did not include any data from the decomposition of the producers.

In part (d)(i), most candidates gained full credit. A surprising number of candidates stated that the leaf litter or the root biomass increased rather than decreased.

In part (d)(ii), apart from a statement that the biomass levels had not recovered to their original values even after 25 years, most candidates did not relate the changes to reasons why the recovery of the land might not be possible.

In part (e), many descriptions did not go beyond a reference to the change or loss of habitats. Where candidates did attempt further expansion, the expression was often too loose or vague. References to organisms or species, rather than animals, moving away were common. Many candidates stated that food chains would change but did not suggest that this would be as a result of the change in plants. Some candidates did gain credit for references to more light or windier conditions but did not follow this with possible effects upon plants or soil.

6104 Unit 4 Core Examiners' Report

	Core information for: Option A	Option B	Option C
Maximum mark.....	40	40	40
Mean mark.....	24.1	23.9	23.9
Standard deviation	7.8	7.6	7.8

Question 1
The majority of candidates performed well on this question, frequently scoring 3 or 4 marks overall. Very few scored full marks as there were relatively few candidates who appreciated that the enzymes involved in oxidative phosphorylation transfer electrons/hydrogen ions from one carrier to the next.

Question 2
This question was also well done; the majority of candidates have a good understanding of myelination and its effect on the rate of conduction of a nerve impulse. What was disappointing was the number of candidates who cant plot information on a graph accurately - the maximum depolarisation of +35mV was frequently plotted as +30mV.

Question 3
Question 3 caused candidates the most problems. The better candidates did score well in part (a) but weaker candidates frequently gave accounts of specific hormones, usually insulin. In part (b) (i) there was the expected confusion between LH and FSH with some candidates hedging there bets and writing the name of the same hormone in both answers. In part (ii) the majority of candidates could tell us that oestrogen levels peaked at day 12 and FSH at day 14, but could tell us little else. Surprisingly few candidates mentioned negative feedback in their attempts to explain the relationship, even though they had mentioned it in part (a).

Question 4
For a kidney question, this was extremely well done. There were some superb accounts of the role of the loop of Henlé in concentrating urine; the better accounts read as though they were straight off the mark scheme. Centres are clearly using our published mark schemes to help candidates express their ideas accurately and concisely. Even the weaker candidates had some idea of what is happening in this region of the kidney although the accounts muddled up the events occurring in the descending loop with the ascending loop.

All candidates attempted part (b) but a surprisingly high number of candidates suggested that the beaver was best suited for very dry habitats! A lot of candidates, including the weaker ones, new that a longer loop of Henlé was an adaptation for animals living in dry habitats.

Part (c) was the weakest section of this question. Frequently made errors included suggestions that either protein or ammonia is deaminated, ammonia is removed from amino acids and the failure to state that urea is carried in the plasma.

Question 5

Splitting this question in to two parts helped many candidates to score well. Part (a) was less well done, unsurprisingly as this is the first time we have tested this part of the specification in this fashion. A wide range of answers were seen, including some very detailed accounts of the components of the grey and white matter. A number of accounts described the reflex arc and not the spinal cord.

Part (b) again illustrated that centres are using previous mark schemes to help their candidates express their ideas; many accounts were straight off the mark scheme giving all the marking points and thus scoring 6 marks max. Even the weaker candidates were scoring 3 or 4 marks in this section.

6104/01 Unit 4 Option A Examiners' Report

	Option only	Core + Option
Maximum mark	30	70
Mean mark	17.5	41.4
Standard deviation	4.8	11.2

Question 6
This question was very well done by all candidates with the majority of them scoring full marks.

Question 7
The performance of candidates on this question was very centre based, particularly on part (c). Candidates who had done streak plating scored full marks easily but there were several scripts where this whole section was left totally blank. Part (b) was more variable with poor expression of information frequently costing candidates the marks.

Question 8
This question produced the full range of marks and was attempted by the majority of candidates. Many confused the clear zone as being a result of bacteria being resistant to the antibiotic so many candidates suggested that antibiotic R was penicillin. Candidates are still bad at giving comparative statements so (b) (i) was not particularly well done.

Question 9
Part (a) and (b) demonstrated again that many candidates find it difficult to describe data appropriately. In part (a) a number of answers referred to the lag, log, stationary and death phases of bacterial cell growth and not the numbers of bacteria present in the culture at any one time. In part (b) it was evident that some candidates still don't understand why pH falls as a result of respiration.

Part (c) again demonstrated that past questions and mark schemes are being used to prepare candidates for the exams - far more candidates were truncating their answers in this exam than the previous time we asked a question of this type. A large number of candidates are still taking log of logs though.

Part (d) was less well done. A high proportion of candidates wrote about diauxic growth suggesting that if the culture period was extended a second log phase would be seen as the bacteria were synthesising new enzymes to metabolise lactose which they assumed was also present in the culture medium. Although these answers did not score them the marks, they did demonstrate a very good knowledge and understanding of diauxic growth!

6104/02 Unit 4 Option B Examiners' Report

	Option only	Core + Option
Maximum mark	30	70
Mean mark	17.0	41.1
Standard deviation	5.0	11.4

Question 6
The majority of candidates gained three or four marks. Where errors were made it was usually due to a lack of knowledge about which sugars are used as substrates for fermentation. Maltose and lactose were both commonly associated with the production of sauerkraut.

Question 7
Most candidates made a reasonable attempt to describe the technique of skinfold measurement in part (a). The vast majority could state the most suitable parts of the body to measure and that they would use calipers. The answers compared favourably with those about other practical techniques that have been seen on previous occasions in this option. In part (b) it was often poor expression that let candidates down. Answers sometimes only referred to one of the disorders and therefore were not differences.

Question 8
In part (a) examiners were often able to award both of the available marks in part (i) and almost all candidates gained at least one mark. However, this was not the case in part (a)(ii) because most failed to compare results at 20°C with those at 5°C. Instead they just described the effect of different concentrations of carbon dioxide at 20°C. In (b) many answers about respiration lacked references to *aerobic* respiration being reduced. Other answers seemed to be referring to respiration of strawberries rather than respiration of microorganisms.

Question 9
In part (a) more than 50% of candidates were unable to use the readings from the graph to calculate a percentage increase in volume. The most common error was to divide by 51 instead of 35. In (b) it was rare to award full marks. Most gained one or two marks usually for stating that carbon dioxide was released during respiration and this was then trapped in the dough.
The answers to part (c)(i) often started well with references to starch being hyrolysed into maltose but a significant number thought this would cause a reduction in the volume of the dough because maltose was smaller than starch. There were some exceptionally good, comprehensive answers in part (ii) in which candidates demonstrated a thorough knowledge of the use of ascorbic acid. Unfortunately other candidates were drawn into irrelevant answers about the use of ascorbic acid as an antioxidant.

6104/03 Unit 4 Option C Examiners' Report

	Option only	Core + Option
Maximum mark	30	70
Mean mark	14.0	37.9
Standard deviation	5.5	12.4

Question 6
Many candidates scored full marks in this question. The most frequently seen error was stating that myoglobin is an immediate source of oxygen.

Question 7
Although we have tested this part of the specification on more than one occasion, candidates were thrown by the different context in which this question was asked. In part (a) candidates commented on the similarity between lymphatic vessels and veins so picked up the valve mark but few told us that the contraction of adjacent muscles helped the flow of lymph through the vessels.

In part (b) there were many descriptions of the structure of a lymph node, which we have asked recently, so candidates picked up the lymphocyte mark and would have picked up the macrophage mark except frequent accounts stated that neutrophils were also present. Answers were also centre based as some candidates could give very detailed accounts of the immune system, which went beyond A level expectations in some cases, whereas there were whole cohorts of candidates who clearly had no idea of the mode of action of antibodies.

Question 8
This question caused many problems. Very few candidates appreciate the differences in intensity of various exercises. One had to smile when a candidate suggested that a marathon should be run three times a week as part of the training programme! Poor expression was responsible in part for candidates not scoring well in the rest of part (a), especially in part (ii) where the candidates were stating that the resting pulse had to be taken at the start of the programme so that it could be compared to the pulse rate at the end of the exercise. In part (iii) few candidates could explain why the resting pulse rate would decrease.

In part (b) marks were lost by those candidates who either failed to give superlative answers or to give precise details

Question 9
Parts (a) and (b)(i) were reasonably well done with the majority of candidates having a really good attempt at the calculation. The answers to (b)(ii) and (c) were very disappointing. Long rambling accounts were given which lacked precise biological detail. In part (c) there was a lot of confusion between the inspiratory and expiratory centres and the external and internal intercostals muscles.

6105 Unit 5B Examiners' Report

Maximum mark 70

Mean mark 34.7

Standard deviation 12.0

General Comments
This paper produced a wide range of responses to almost all sections of questions. There did not seem to be any particular questions which posed problems for the majority of candidates. The ability to give clear definitions of terms or to use terminology accurately proved difficult for some candidates.

Question 1
This proved to be a relatively straightforward opening question for most candidates. The most common error was to confuse Family and Class.

Question 2
In part (a) many candidates found it difficult to give a response that was little more than a rewording of the question e.g. it is a factor that limits photosynthesis. There were some very good responses that gave clear statements that covered all of the mark points.
Part (b) was done well by most candidates. The most common errors included vague references to methods of control e.g. temperature can be controlled by keeping the apparatus in a warm room. At this level it is also expected that candidates should be able to give the full correct names for any reagents used e.g. sodium hydrogencarbonate rather than just hydrogencarbonate.
Part (c) proved to be very discriminating. Candidates who had practical experience tended to do well even if they had not actually used this apparatus. Many candidates thought that the bubbles would go into the capillary tube by themselves. It was also evident that many candidates confused this apparatus with a potometer. The conversion of the length measurement to a volume was only given by the better candidates. There were relatively few references to equilibration or to the use of repeats.
In part (d), candidates usually referred to changing the wavelength but did not state how this might be achieved. There were many references to changing the distance of the lamp. However, most candidates gained one mark for a reference to the control of other factors.

Question 3
Part (a) was usually answered correctly. Some candidates made reference to the removal of the rabbits but did not explain that this would mean that there would be less vegetation being eaten.
Part (b)(i) was very disappointing. Very few candidates seemed to have any knowledge of this term.
There were some very good answers to part (b)(ii) with sound use of terminology and clear descriptions of the seral stages. Most candidates gained some marks for references to the removal of the grazers and the changes in vegetation to shrubs and trees.

Question 4

In part (a)(i) the calculation of the percentage was correct on approximately half of the scripts. The most common error was to divide by 9 rather than by 6.

Most candidates gave a correct answer to part (a)(ii). It should be noted that reference to water being reabsorbed was expected and not just to the absorption of water.

In part (b), there was considerable confusion shown by candidates as to exactly where diffusion and active transport are involved. Many candidates contradicted themselves by references to diffusion against concentration gradients. The majority or candidates were able to gain some credit by reference to the microvilli and the mitochondria.

Answers to part (c) usually gained full credit.

Question 5

In part (a) the responses were disappointing. Many candidates referred to DNA or chromosomes as the carriers of genetic material. However, there were some very good answers that made reference to all of the mark points.

In part (b)(i), most candidates made a reference to the smaller surface area. Answers that included descriptions of different haemoglobin structure or less haemoglobin were less common.

In part (b)(ii) most candidates gave clear diagrams and used the correct symbols. A significant number of candidates did not show the gametes that could be formed from the parental genotypes or did not show the parental genotypes. Similarly a number of candidates did not identify the genotype that would give a sufferer of sickle cell anaemia. Some candidates tried to explain the answer using sex linkage.

The most common mistake in part (b)(iii) was to give the probability of the next child being a sufferer rather than a carrier. However, most answers were correct. It is expected at this level that probability is expressed correctly as a fraction, decimal or percentage; ratios were not accepted.

In part (c), relatively few candidates gave accurate descriptions of how a substitution point mutation would eventually be translated as a change in a single amino acid. Many candidates included irrelevant references to deletion, addition and frame shift. There were some examples of very poor expression by candidates e.g. references to DNA having a sequence of amino acids in its structure, incorrect amino acids being formed at translation, amino acids are coded for in threes on DNA,. The terminology was often confused e.g. translation and transcription, codon and anticodon. However, there were some excellent answers that gave clear accounts and included almost all of the mark points.

Question 6

In part (a) approximately half of the candidates gave a correct response. Nitrifying bacteria were often named as examples. A significant number of candidates left this section blank.

For part (b), most candidates were able to refer to the formation of ammonia from nitrogen. The better candidates also referred to catalysis by the enzyme. A common error was to state that nitrogen was converted to nitrates.

In part (c) very few candidates gave answers that explained how the activity of the enzyme might depend upon ATP and metal ions. Most candidates were able to make reference to ATP as a source of energy but only the better candidates were able to follow this with further credit. A common error was to describe how metal ions might act as inhibitors.

Part (d) was answered well by a significant number of candidates. There were some confusions in the details of the methods involved e.g. enzyme actions, source of

nitrogenase enzyme, ways of incorporating recombinant DNA into wheat. A number of candidates either did not attempt an answer in this section or gave answers which indicated no knowledge of this topic.

Question 7

Part (a) was quite a high-scoring section. Some candidates penalised themselves by quoting figures rather than describing changes. Other candidates referred to changes occurring in a year rather than between two years e.g. there was a decrease in 1996.

In part (b) most candidates gave acceptable mixtures although relatively few quoted the correct proportions. Incorrect answers included mixing the ethanol with biogas or gasohol.

In part (c) there were some very good answers that included clear descriptions of the conversion of starch into glucose and the anaerobic respiration of the glucose resulting in ethanol. Very few candidates did not gain some credit in this section. The main error was to omit detail rather than to state incorrect facts.

Answers to part (d) were almost always correct.

6106/02 Unit 6 W2 Written Alternative Examiners' Report

Maximum mark 38

Mean mark 14.0

Standard deviation 4.6

General Comments

A majority of candidates were able to score well on several parts of this paper but this was rarely sustained throughout. Tabulation and interpretation were often done well but making objective conclusions and applying ecological techniques from the specification were much more varied.

Question 1

(a) The simple manipulation and tabulation was completed accurately by a majority of candidates but many did not rank the data.
(b) Many correctly chose a scattergram or line of best fit although the latter was only accepted where some attempt had been made to select the line carefully. Those choosing awkward numerical scales often did not plot their points with sufficient accuracy.
(c) A large majority gained two marks for accurate substitution and calculation.
(d) At this level it was expected that candidates would accurately describe the correlation as both significant and positive but few gave this full description.

Question 2

(a) Candidates who made a simple adaptation of the capture/recapture technique and described random sampling to estimate acorn numbers quickly gained high marks in this section. However it was surprisingly common for either estimation of squirrel numbers or acorn abundance to be treated very superficially and hence many marks were more limited.
(b) As in previous papers, candidates who paid careful attention to the method they had described when compiling tables and suggesting methods of analysis gained full marks, but many made careless errors such as omitting full titles to table columns or graph axes or failing to account for repeat readings.
(c) A greater proportion of candidates than in previous papers gained some marks in this section, but this was often linked to theoretical limitations of the Lincoln Index rather than a careful consideration of the methods they had described. Higher scoring candidates were also able to suggest relevant further work such as estimating abundance of other food supplies or repeating the exercise where both species of squirrels were present.

6106/03 Unit 6 Synoptic Examiners' Report

Maximum mark 38

Mean mark 18.9

Standard deviation 6.0

General comments
Synoptic questions are intended to assess the ability of candidates to bring together principles and concepts from at least two units of the specification and apply them in a particular context, expressing ideas clearly and logically and using appropriate specialist vocabulary. Candidates are also expected to apply biological skills in contexts which bring together different areas of biology.

It follows, therefore, that success in synoptic questions requires a sound knowledge and understanding of the specification content, and an ability to apply this in new and possibly unfamiliar contexts. It is important that candidates read the information provided in the questions and apply their knowledge and understanding to answer the questions correctly.

Overall, this was a high scoring Paper, with questions that were accessible to many candidates. Good answers were seen to both of the structured questions, and a number of the essays contained accurate and relevant information. The majority of candidates attempted question 4B, there were very few attempts at question 5H. Relatively few of the essays attempted to integrate knowledge in a coherent way, and the style of the essays was rather poor in a number of cases. Candidates are reminded that, to gain a high mark for coherence, essays are expected to be written in continuous prose. Short notes, with separate subheadings and bullet point lists are not acceptable here. In the essays, it is important to include relevant information from both AS and A2 units to gain high marks for both scientific content and balance.

Question 1
In part (a), the majority of candidates scored marks for describing the overall changes in the concentrations of both monosaccharides and lipids; many also referred correctly to the fact that the concentrations of both compounds remains constant after 240 minutes. Better candidates also included a suitable quantitative comparison, such as working out the overall changes in both compounds. In part (b), many candidates correctly indicated that monosaccharides are used as a source of energy during the flight, and some referred to the sequence in which monosaccharides and lipids are used as substrates. Some candidates failed to note that locusts use lipids as energy sources when flying and attempted to describe other reasons for the changes in lipid concentrations, such as conversion to carbohydrates. Answers to part (c) usually referred to the breakdown of glycogen to glucose and the subsequent use of glucose as a substrate for respiration. However, some of the answers were poorly worded, suggesting that, for example, the breakdown of glycogen provides energy directly. A number of answers included irrelevant details about the possible involvement of insulin and glucagon.

Question 2
Many candidates correctly interpreted the information provided, applied their knowledge and understanding of units 3 and 5, in particular, and gained good marks. Part (a) was usually answered correctly; some answers contained contradictory statements, such as 'carnivore (second trophic level)'. In part (b)(i), many candidates correctly observed that birds that hatched early in the breeding season had the highest chance of survival; this was frequently justified with a suitable quantitative comment. Some candidates gave only general descriptions of the changes in percentage survival, but sometimes gained a mark for an

appropriate quantitative comment. Relatively few referred accurately to the greatest change between May 10th and May 20th and the subsequent steady decrease in percentage survival.

The answers to part (b)(ii) were very variable, relatively few candidates gained two marks. Answers usually referred either to changes in the availability of food, or to changes in the numbers of predators, and so gained one mark. Some answers were considered to be too vague to be worthy of credit. As an example, there were a number of references to 'climate'. Part (c)(i) was answered well by a number of candidates, who both correctly read the value from Graph B and calculated the answer. One common error was in reading the percentage survival as 15% (rather than 18%). Nevertheless, candidates who then gave a suitable calculation based on 15% and quoted the answer as 1 bird, were allowed some credit.

In part (c)(ii), references to increased food reserves and ability to outcompete other birds were seen quite often and many candidates gained both marks for this part. Other mark scheme points, such as references to temperature control or to increased growth, were seen occasionally. The majority of candidates gained at last one mark in part (c)(iii). Many candidates correctly indicated that birds hatched early in the season, and with the highest mass at 15 days, had the highest chance of survival. A common error here was in reading the mass incorrectly from the graph.

Almost all candidates scored marks in part (d); references to protection from predators and protection from adverse weather conditions were seen commonly.

Question 3

This essay was less popular than question 4B. Many of the accounts included references to the evens during meiosis, such as crossing over and independent assortment, but it was not always clearly explained how these events cause genetic variation. Descriptions of point mutations were also frequently included, but again the consequences of these were not always described in detail. Good accounts also included references to random fertilisation and chromosomal mutation as causes of genetic variation.

Question 4B

The majority of candidates attempted this topic and the standard of answers was very variable. Many included relevant details of leaf structure, from unit 2B, but only better candidates attempted to relate the structure of a leaf to its function in photosynthesis. Some accounts included largely irrelevant details of photosynthesis, rather than concentrating on the effects of environmental factors on photosynthesis. Accurate details from unit 5B were relatively rare; many of the answers included rather superficial information only. References to light intensity, temperature and carbon dioxide concentration were usually included, but the effects were often described briefly as, for example, 'as light intensity increases, the rate of photosynthesis also increases'. The Examiners expected references to limiting factors and, although the term was sometimes used, it was rarely adequately explained. Very few candidates included any information about the effect of light wavelength on photosynthesis, or correctly referred to the light compensation point.

Question 5H

Very few candidates attempted this question, and the standard of answer was generally rather poor. Essays usually included an outline account of DNA structure, but little or no relevant information from unit 5H about how DNA and proteins provide evidence for human evolution. References were expected to DNA hybridisation, comparisons of base sequences and amino acid sequences, and immunological studies of blood sera to investigate phylogenetic relationships between primates.

APPENDIX A
UNIT GRADE BOUNDARIES AND UNIFORM MARKS

The raw mark obtained in each module is converted into a standardised mark on a uniform mark scale, and the uniform marks are then aggregated into a total for the subject. Details of the method of aggregation are given in Appendix A.

For AS examinations, the three unit tests each have a weighting of 33.3% with a maximum of 100 uniform marks.

For the A level, the six unit tests each have a weighting of 16.7% with a maximum of 100 uniform marks.

The table below shows the boundaries at which raw marks were converted into uniform marks in this examination. The A and E grade boundaries are determined by inspection of the quality of the candidates' work. The other grade boundaries are determined by dividing the range of marks between A and E. Marks within each grade are scaled appropriately within the equivalent range of uniform marks.

In Unit 3, the A and E boundaries are determined separately on the two components Paper 01 (T1) and Paper 03 (or Paper 02 (W1) and Paper 03 for International candidates only). These marks are then added together to find the A and E boundaries for Unit 3 as a whole, and the other grade boundaries for the Unit are then found as described above. Boundaries for the B, C and D grades for each component can be calculated in the same way, but please note that these are **not** simply added together to obtain the B, C and D boundaries for the unit as a whole.

In Unit 6, the A and E boundaries are determined separately on the components Paper 01 (T2), Paper 02 (W2) and Paper 03. These marks are then added together to find the A and E boundaries for Unit 6 as a whole, and the other grade boundaries for the Unit are then found as described above. Boundaries for the B, C and D grades for each component can be calculated in the same way, but please note that these are **not** simply added together to obtain the B, C and D boundaries for the unit as a whole.

Unit grade boundaries for January 2006 can be found on the next page.

Unit grade boundaries

Unit	Maximum mark	Grade				
		A	B	C	D	E
	Uniform marks					
	100	80	70	60	50	40
	Raw marks					
6101 Unit 1	60	42	37	32	28	24
6102 Unit 2B	60	38	35	32	29	26
6112 Unit 2H	60	40	36	33	30	27
6103 Unit 3	70	50	44	38	32	27
Paper 01 T1	*32*	*26*	*22*	*18*	*15*	*12*
Paper 03	*38*	*24*	*22*	*20*	*17*	*15*
6103 Unit 3 (International option)	70	46	41	36	31	26
Paper 02 W1 International only	*32*	*22*	*19*	*16*	*14*	*11*
Paper 03	*32*	*24*	*22*	*20*	*17*	*15*
6104 Unit 4 Option A	70	54	49	44	39	35
6104 Unit 4 Option B	70	54	49	44	39	35
6104 Unit 4 Option C	70	51	45	40	35	30
6105 Unit 5B	70	48	43	38	33	29
6106 Unit 6 (Option 1)	70	51	46	41	36	31
Paper 01 T2	*32*	*24*	*21*	*18*	*15*	*12*
Paper 03	*38*	*27*	*25*	*23*	*21*	*19*
6106 Unit 6 (Option 2)	70	48	43	38	33	29
Paper 02 W2	*32*	*21*	*18*	*15*	*12*	*10*
Paper 03	*38*	*27*	*25*	*23*	*21*	*19*

APPENDIX B
The Uniform Mark System for AS and A level Unit Schemes

The result for each unit will be issued as a standardised mark on a uniform mark scale. AS subjects have a total of 300 uniform marks and A level subjects have a total of 600 uniform marks.

Tables 1 and 2 show the numbers of uniform marks required to gain each subject grade in AS and A level examinations. They also indicate the number of uniform marks in units with various weightings that will aggregate into the appropriate subject grade. These provide a guide to the level of performance in each unit.

The uniform marks shown for each unit do not necessarily represent the actual mark range used for marking. Grade boundaries are set at Awarding meetings on the basis of candidate performance on the actual mark range used. These boundaries are then converted to the uniform marks shown in the tables, with intermediate values calculated accordingly.

Table 1 – Advanced Subsidiary Subjects

Subject		Unit Weighting					
Grade	**UMS**	**20%**	**30%**	**$33\frac{1}{3}$%**	**40%**	**50%**	**60%**
Max mark	**300**	60	90	**100**	120	150	180
A	**240**	48	72	**80**	96	120	144
B	**210**	42	63	**70**	84	105	126
C	**180**	36	54	**60**	72	90	108
D	**150**	30	45	**50**	60	75	90
E	**120**	24	36	**40**	48	60	72

For example, a candidate for AS Biology or Biology (Human) must take three modules, all weighted at 33.3% of the subject.

	Uniform mark obtained	**Approximate level of performance**
Unit 1	65	C
Unit 2	73	B
Unit 3	80	A
Subject Total	**218**	**Subject Grade = B**

Table 2 – Advanced Level Subjects

Subject		Unit Weighting				
Grade	**UMS**	**15%**	**16^2_3%**	**20%**	**25%**	**30%**
Max mark	**600**	90	**100**	120	150	180
A	**480**	72	**80**	96	120	144
B	**420**	63	**70**	84	105	126
C	**360**	54	**60**	72	90	108
D	**300**	45	**50**	60	75	90
E	**240**	36	**40**	48	60	72

For example, a candidate for A level Biology or Biology (Human) must take six units, all weighted at 16.7%. The candidate in this example has four units in the bank.

	Uniform Mark Obtained	**Approximate level of performance**
Unit1	78	B
Unit 2	65	C
Unit 3	75	B
Unit 4	82	A
Unit 5	50	C
Unit 6	*	
	Partial Total in Bank = 350	

The candidate already has 350 uniform marks in the bank. If a Grade C is required in the subject, the candidate must obtain at least 10 UMS marks from Unit 6 or if a Grade B is required the candidate must obtain 70 UMS marks or more from Unit 6.

There is no rule requiring candidates to take units amounting to 30% of the examination at the time of cashing in, nor do candidates have to take all papers with synoptic assessment at the same time at their first cash in.

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