GCE

Edexcel GCE

Biology (8040/9040)

Biology (Human) (8042/9042)

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Summer 2006

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Examiners' Report

Edexcel GCE
Biology (8040/9040)
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Contents

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

6101 Unit 1 Examiners' Report

Maximum mark 60

Mean mark 29.5

Standard deviation 10.6

General comments

Questions 1,4(b), 5(b)(ii) and 8(a)(i) were relatively high scoring. Questions 4(a), 6(a), 7(b) and 7(c)(ii) were low scoring.

Question 1

A significant number of candidates were able to gain full marks, but some candidates could not recall which nucleic acid contained uracil and others were unfamiliar with the occurrence of phosphodiester bonds.

Question 2

Very few candidates gained all four marks on this question. The most common reason for losing a mark was a failure to qualify insulation. A significant number also stated that the cuticle is a role of lipids in leaves.

Question 3

Almost half of the candidates correctly labelled three appropriate parts of an *E.coli* cell, but relatively few could draw the cell accurately. Candidates were expected to draw a cell showing a cell wall, circular DNA and flagellum. Credit was also given for labelling any three of the following structures: the cell wall, invaginations of the surface membrane, the flagellum, chromosome (or circular DNA), a plasmid, and 70S ribosomes.

Question 4

In part (a) it was disappointing to note that almost half of the candidates failed to identify correctly any of the three parts of the chloroplast. Relatively few were able to recognise structure C as a starch grain and more commonly stated that it was a nucleus or a vacuole. The calculation in part (b) was more mark yielding, although there were many candidates who were unable to convert millimetres into micrometres.

Question 5

In part (a), most candidates were able to gain at least one mark for the drawing of the dipeptide. Often the reason for losing a mark was for the careless omission of part of the side group, rather than a lack of knowledge of the peptide bond.
In part (b)(i), some candidates confused tertiary and secondary structure, but most gave suitable descriptions, and then went on to compare the results provided in part (ii). Few candidates gained both marks in (b)(iii), usually because they associated increased temperature with faster formation of peptide bonds, rather than with the breaking of hydrogen bonds.

Question 6

In part (a), relatively few could explain the meaning of the term water potential. A lot of candidates did not recognise the significance of the word potential and described the ability of water to move, rather than the tendency, or likelihood, of water to move. Others simply described osmosis. Although part (b) was generally well answered, a significant number referred to the movement of sucrose, rather than water. In (b)(iii) some candidates stated that there would be no movement of water and did not appreciate the idea of no net movement of water. There were many answers to part (c) that focused on the structure of cellulose molecules, rather than the structure of the cell wall.

Question 7

Part (b) of this question was very similar to question 5 on the June 2005 paper, yet this still remains a technique with which a significant number of candidates seem to be unfamiliar. As last year, marks were mostly gained for giving the name of a suitable stain, or for squashing under a coverslip. Some candidates referred to the points that examiners were looking for, but gave the stages in an incorrect sequence.
In part (c)(ii), some answers were seen which seemed to indicate that the candidates had an understanding of this investigation. However, some answers did not accurately distinguish between a chromosome and a chromatid.

Question 8

Part (a)(i) was well answered, but in (a)(ii) many just referred to a similar shape and did not consider the chemical structure, which showed similar groups at each end of the molecules. In part (a) (iii), many candidates were satisfied with saying that the inhibitor would not bind to the active site, but did not comment on where it would bind. Poorly expressed answers frequently resulted in loss of marks in (b)(ii). For example, there were references to "all enzymes being used up", rather than stating that "all enzymes are occupied". In (b)(iii), a significant number of candidates attempted to describe the effect of substrate concentration when a non-active site-directed inhibitor was present. This took their focus away from the actual question asked.

6102 Unit 2B Examiners' Report

Maximum mark 60

Mean mark 30.3

Standard deviation 12.7

General comments

This was considered to be an accessible paper, which gave opportunities for all candidates to show their knowledge and understanding of the specification content. Parts of some questions were accessible to weaker candidates, whist the more challenging questions were answered successfully by potential A grade candidates.

In general, questions 1, 5, 6(a) and (c), 7(b) and 8(a) were answered well. Questions which candidates found more difficult include 2(b) and (c), 3(a), 4(b), 7(a) and 8(d). Question 3(a), in particular, was not answered particularly well; the formation of tissue fluid is a topic which candidates have found difficult to explain in previous examinations. The standard of answers to other questions was very variable.

One common failing was the lack of selectivity of information in many of the answers, which suggested that candidates had not thought carefully about what the question is actually asking, but rather wrote anything vaguely related to the topic. As an example, many of the answers to question 2(c) included irrelevant details of oxygen transport, before addressing the question. The general standard of spelling, particularly of biological terms, continues to disappoint the Examiners.

Question 1

This was a high-scoring question and the majority of candidates gained all four marks. The most common error was in completing the first space; 'internal' was seen frequently.

Question 2

The identification of the cells was rather variable; in general, candidates seemed to be more familiar with the neutrophil than the lymphocyte. In part (b), many candidates gave general accounts of the roles of leucocytes in defence, without referring specifically to the lymphocyte. A number of candidates correctly indicated that these cells secrete antibodies, but then went on to describe their apparent role as phagocytic cells. There were some good, detailed accounts of the role of erythrocytes in the transport of carbon dioxide in part (c), but equally there were some very poor attempts with no relevant information. As mentioned in the general comments, many of the answers to this question contained irrelevant information, such as details of oxygen transport, or the transport of carbon dioxide in the plasma. A number of candidates correctly stated that carbon dioxide combines with haemoglobin, but then incorrectly named the product as carboxyhaemoglobin.

Question 3

Although there were some good, detailed explanations of the formation of tissue fluid, with appropriate references to the hydrostatic (or blood) pressure, the permeability of the capillary wall and consequent movement of water, many of the answers contained no relevant information. It is recognised that this topic has proved difficult for candidates in the past, but it was disappointing that so many were unable to give an accurate explanation of this process. As with question 2 (c), many of the answers contained irrelevant information, in this case relating to the reabsorption of tissue fluid and the formation of lymph. However, whilst relatively few gained good marks in part (a), parts (b)(i)and (ii) were generally answered more successfully with appropriate references to the relative sizes of proteins and sodium ions, in relation to capillary permeability. It was noticeable that a number of candidates who gained no marks in part (a), nevertheless clearly understood the idea of capillary permeability and, consequently, gained marks in part (b) of this question.

Question 4

Approximately half of the candidates named the microvillus correctly, as perhaps many had failed to notice the scale of the electron micrograph. Relatively few answered part (a)(ii) correctly, the majority of answers were descriptions of absorption, rather than digestion. There was a wide range of answers to part (b), with some detailed descriptions of sodium-glucose co-transport. A fairly generous mark scheme enabled candidates to gain credit for naming the processes involved, although the actual context was not always entirely clear. Some answers were, however, irrelevant descriptions of digestion. In part (c), whilst many candidates gained a mark for stating that jam contains sugar (or a named simple sugar), relatively few were able to explain why the blood glucose concentration rises more quickly after eating white bread and jam, than it does after eating wholemeal bread only. Many of the answers referred to differences in blood glucose concentration, rather than to differences in the rate of increase of blood glucose.

Question 5

The majority of candidates answered part (a) correctly and generally coped well with part (b). One common error in part (a) was the multiplication of the number of stomata by 0.102. Many candidates gained one mark in (b)(i) for a description of the change, fewer included an accurate quantitative comment for the second mark There was a tendency to make rather vague generalisations, such as ‘increasing by about 4’. There some very good answers to part (b)(ii), with references to changes in the water potential, movement of water into the guard cells and the consequent increase in turgor. Overall, it was pleasing to see that so many candidates answered this question well.

Question 6

The majority of candidates named the pollen tube correctly, but the answers to part (b) were more variable. Candidates who were familiar with the topic of fertilisation in flowering plants invariably gave good answers and gained full marks. However, answers to this part were rather polarised as almost equal numbers of candidates gained no marks at all. Some of the answers included details of pollination and growth of the pollen tube, before answering the question. A number of candidates used the terms ‘nucleus’ and ‘nuclei’ interchangeably and, as a result, their answers were sometimes ambiguous and incorrect. The majority of candidates answered part (c)(i) correctly and there were some good, detailed descriptions in part (c)(ii), with appropriate references to the figures shown in the graph.

Question 7

The answers to part (a) were very variable. Although many candidates identified the stage as prophase, this was not always qualified as prophase I. However, candidates usually subsequently gained credit for references to pairing of chromosomes and to crossing over. The majority of candidates answered part (b) correctly, although a number incorrectly indicated that both the sperm and zygote are haploid. In part (c), there were a number of references to the formation of haploid gametes, but without indicating that they are formed from diploid cells. Many candidates gained a mark here for a reference to the restoration of the diploid state following fertilisation. There were many references to variation, but this was less often qualified as genetic variation.

Question 8

The majority of candidates named the corpus luteum correctly in part (a), but the answers to part (b) were more variable. Many candidates referred to either the inhibition of LH (or FSH) or maintenance of the endometrium. However, in a number of cases, candidates referred to either maintenance of the uterus wall (rather than lining, which would have been accepted) or to maintenance of the lining of the endometrium (which was not accepted). Part (c) was sometimes not attempted, but about half of the candidates drew a correct line. The final part of this question proved to be a good discriminator. A number of answers contained no relevant information at all, or focussed on the role of oxytocin in either birth or lactation. However, there were some excellent and detailed accounts of the roles of oxytocin which gained full marks.

6112 Unit 2H Examiners' Report

Maximum mark 60

Mean mark 23.9

Standard deviation 10.7

General comments

Questions 1, 2, 3, 4 and 8 on this paper were common with 6102 and, overall, the standard of answers was slightly lower on 6112 than on 6102. There were some good answers to questions 5 (a) and 7 (c). In general, candidates found questions 6 (c) and 7 (d) more challenging.

Questions 1 to 4

Common with 6102

Question 5

There were some good answers to part (a), which included details of the cardiac cycle. As a general rule, it appeared that those candidates who were familiar with this term, readily gained good marks for describing the correct sequence of events; otherwise candidates scored rather poorly, often for describing the double circulation. Answers to part (b)(i) were very variable; although many candidates correctly labelled the R wave, many incorrectly indicated the T wave. Answers to (b)(ii) were also very variable. Although there were some good explanations in terms of the coordination of the sequence of events during the cardiac cycle, there were also many incorrect responses, including general descriptions of the circulatory system.

Question 6

The majority of candidates gained one mark in part (a) for a general description of the relationship between altitude and air pressure, but this was less often supported by an appropriate quantitative reference, using the data in the table. Many candidates gained a mark in part (b) for a simple subtraction. In part (c), whilst many candidates continued the idea that air pressure decreases as altitude increases, this was rarely supported with reference the effect of altitude on the partial pressure of oxygen. The majority of candidates who gained marks in this part did so by referring to altitude sickness, often including lists of symptoms. Relatively few candidates commented on the necessity for oxygen to maintain consciousness.

Question 7

In part (a), the majority of candidates incorrectly assumed that the diploid number of the cell shown was 46, but the answers to part (b) were generally good and candidates were able to put the stages into the correct sequence. Answers to part (c) frequently included good descriptions of the events of meiosis which give rise to genetic variation. Similarly, many candidates were able to give clear descriptions of the maintenance of chromosome numbers following fusion of haploid gametes. However, linking meiosis to spermatogenesis was less successfully answered; few of the accounts included an accurate sequence of events. In part (d), it was clear that many candidates appreciated that relatively few sperm reach the site of fertilisation. There were also a number of references to motility, but the other mark scheme points were seen rarely.

Question 8

Common with 6102

6103/01 Unit 3 T1 Individual Investigation Moderators' Report

Maximum mark 32

Mean mark 20.6

Standard deviation 5.6

General Comments

Overall, the standard was very similar to that of previous years, though a larger number of candidates than in the past performed real investigations that demonstrated high levels of skill in all departments. Many undertook standard exercises on enzyme activity, with some, though not most, gaining high marks. Very few carried out inappropriate tasks.

Moderators commented on Centres' improved standards of administration. There were fewer submissions with old Record Cards so that most carried signatures of both teacher and candidate. However, as a further reminder, an up-to-date Record Card is to be found by logging on to www.edexcel.org.uk and activating *Qualifications,* then scrolling through *Biology, AS GCE Biology, Guides* and finally selecting *Record Sheet.*

Annotations were more helpful and complete than in the past, and most Centres demonstrated reasonable accuracy when awarding marks for each criterion. Nevertheless, a small number either accepted a standard much lower than moderators, or did not recognise an important omission in one sub-section.

The general strengths and specific aspects that presented most difficulty in each criterion are outlined below.

Planning

General strengths included hypotheses, apparatus and justification, and safety.

However, as in previous years, biological knowledge and control of variables remained limiting factors. With regard to biological knowledge, weaknesses were of three kinds.

- Insufficient detail for AS candidates.
- A great deal of background material without anything related to the hypotheses at all.
- Relevant detail hidden amongst a general trawl through everything that candidates knew, for example, about enzymes.

Variable control remains an aspect of Planning that is only understood well by a minority. Many candidates identified variables that require control, but provided little specific detail. Many also considered that monitoring variables, such as temperature, was a substitute for the mechanism by which control could have been achieved.

Implementing

Accurate assessment of sub-sections (a) and (b) is dependent on teacher annotation. This year, as in the past, a large proportion of Centres made no comment on their candidates' performance during the practical activities themselves. Tables of original data often lacked descriptive headings, showed poor organisation of columns and rows, omitted units or repeated them in the body of the table.

Analysing

In sub-section (a), many candidates produced summary data and graphs of the correct type, with accurate plots, well drawn lines and all other detail for the award of 8 marks. Nevertheless, there was a large minority who did not understand the need for summary data, or for selectivity in their graphs. The lack of selectivity was both because candidates did not understand the difference between continuous and discontinuous data, so that all types of graph were displayed, and because they plotted data for all repeats. A single graph with correct plots, well-drawn lines and range bars, is often sufficient for a maximum score.

Trends and patterns were often inadequately described. As an example, many candidates started their description on optimal conditions on enzyme activity with 'as you will see there is an optimum', but then failed to describe any trends at all. Before comments on anomalies are rewarded, moderators need to read descriptions that fully describe events, with the correct use of terminology. Comments such as 'the graph or line falls' are not sufficient, since reference must be made to the changes in terms of the variables investigated.

The best candidates described the relationship between their trends and biological knowledge. Most, however, simply re-stated details in the Plan, but failed to recognise that this biological knowledge was not 'fit for purpose'. In such cases, the best mark is 4 (c).

Evaluating

Since last year, Centres have certainly encouraged the development of an awareness of the concepts addressed in E (a). Many are raising their candidates' achievement in this area. Nevertheless variability and reliability were not generally well understood once again. Often candidates simply referred to the two terms, but failed to comment on their data in order to substantiate their claims. Centres need to make further efforts in order to improve performance even more.

As Part (a) improved this year, Part (b) became more often a limiting factor. Difficulties were often of a general kind. In addition, candidates frequently neglected to recognise the actual difficulties that they encountered, or only described those that resulted from poor planning. Further work was often inadequate mainly because it lacked relevance.

It is not an easy task to develop well-focused ideas about further work. However, restricting them to the variable investigated and making them relevant to the problems that are at the centre of the investigation itself, will enable moderators to accept high marks.

6103/02 Unit 3 W1 Written Alternative Examiners' Report

International Only

Maximum mark 32

Mean mark 14.1

Standard deviation 4.5

General Comments

This paper produced a very wide range of marks, though it rarely enabled candidates to score more than 26. All parts of the paper were accessible, though question 1 yielded lower scores than in the past. The procedures required in question 2(a) were well understood and the mean score improved compared to June 2005.

Question 1

(a) Most candidates usually attain maximum marks on this part of the question. This year the modal value was three, since most did not convert the collection dates to days or weeks between them. Most generated correct and consistent totals.

(b) Many scored maximum marks. Nevertheless the percentage of candidates presenting the wrong type of graph was unusually high. In addition, plotted points and lines were frequently careless.

Overall, Centres prepared candidates for the skills assessed in parts (a) and (b) very well indeed.

(c) Answers rarely focused on variability. Many candidates chose to answer a different question on trends and patterns. Examiners expected descriptions of variability in the context of the differences in numbers shown in the samples. Candidates only rarely achieved a mark above one.

(d) Two or even three marks were frequently scored on the limitations of the techniques used.

Question 2

(a) Marks of five were frequently seen and maximum scores were not uncommon. Candidates detailing procedures and appropriate control of variables easily attained nine marks. Many answers demonstrated the right approach, but failed to score highly because they lacked sufficient precision. For example, points 6, 7, 8, 9 and 10 in the mark scheme required references either to measurements of breathing rate, or to identification of the types of exercise and their duration. For example, point 6 defined breathing as a measurable entity. Many candidates only made general comments.

A surprising number of answers described pulse rate measurements. Nevertheless, the mark scheme allowed for a maximum score of seven.

(b) Tables and graphs that correlated with the plan were uncommon. Tables must demonstrate how data collected using the proposed procedures are displayed. If, for example, repeats are suggested in the plan, columns must be included for these data. Types of graphs and orientation of the axes were often poorly defined.

(c) Most candidates gained little reward for limitations, though rather more for further work. Usually the limitations described were omissions caused by poor planning. These are not accepted either in this paper or in coursework. Examiners are looking for features that are beyond control in normal laboratory situations, but which would certainly restrict reliability.

Further work, as in coursework, must relate to the variable investigated. Many candidates wrote down at least two appropriate points.

6103/03 Unit 3 Paper 03 Examiners' Report

Maximum mark 38

Mean mark 20.6

Standard deviation 7.1

General comments

This paper was answered reasonably well in most sections by the majority of candidates. Compared with previous years, there were relatively few very poor scripts where candidates made little attempt to answer any of the questions. However, in certain sections many candidates did not concentrate upon the relevant points and wrote extended answers, well beyond the expectation of the question. The examiners were pleased to see that the majority of candidates made considerable effort to present their answers in a clear and legible manner; it is a pity that some candidates still present their work in an extremely untidy and careless manner.

Question 1

The answers to this question were extremely variable. Some candidates wrote extremely detailed answers that included almost all of the available marking points. A significant number of candidates included irrelevant details of the lifestyle or life cycle of the organisms. A common confusion, as in previous examinations, was to confuse *Rhizobium* and *Rhizopus*; some candidates wrote identical and sometimes mixed accounts for both organisms. There was a noticeable number of completely blank scripts.
(a) Most candidates who described the correct organism scored well. There was some vague terminology e.g. 'lives on dead organisms'. Some candidates wrote general accounts of digestion involving all enzymes, rather than concentrating upon the digestion of proteins.
(b) There were some very good accounts. Many candidates stated that the plant uses the ammonia to make the amino acids that are then given to *Rhizobium*. Some candidates stated that *Rhizobium* is a fungus. Candidates who thought that *Rhizobium* lives in the rumen of cattle or sheep were still able to gain some credit for the idea of mutualism.
(c) The majority of candidates were able to state that *Taenia* is a parasite. The details of how it obtains its amino acids were less clear. Many candidates referred to the fact that proteins are pre-digested, but did not make it clear that it was the host's enzymes that are involved. Some candidates stated that the host digests the amino acids. Many candidates referred generally to 'food' or 'digestion products' being absorbed by the body of the tapeworm.

Question 2

This question was generally high-scoring.

(a)(i) Most candidates gained full credit. Some candidates used vague terminology e.g. mixing with clouds, or were not quite accurate e.g. sulphur dioxide dissolves in water and then evaporates into the atmosphere.
(a)(ii) Most candidates gained full credit. However, there were some surprisingly poor readings, even though the examiners allowed some latitude.
(a)(iii) Most candidates gained some credit. The most common errors included vague unqualified references e.g. less fossil fuel is being used, cars are not used as much, less sulphur dioxide is emitted by factories.
(b) A relatively small number of candidates scored full credit. Many candidates did not make it clear whether they were referring to the combined effects or to the separate effects. Many

quoted figures without using them comparatively or attempting any manipulation. A common error was to ignore the control data when giving the increased mortality effects. There were some very long, irrelevant answers that described how the fish would be affected by the low pH or high aluminium.
(c) This section was generally high-scoring. Some candidates misread the word vertebrate and described the effects upon the invertebrates. Irrelevant details concerning the effects on other organisms were common. A number of candidates thought that an increased rate of mortality was a beneficial effect, even though the information in the question explains the term.

Question 3

The answers to this question generally ranged from reasonable to very good. Some candidates misread the graph keys and confused the two species of algae. This meant that they were penalised in part (b).
(a) Most candidates gained full credit. A common error was to refer to the periwinkles as secondary consumers. Some candidates gave the roles as autotrophs and heterotrophs without further qualification.
(b)(i) Candidates were credited whether they described each pool separately or each type of alga. Most candidates gained full credit. A noticeable number of candidates described the changes in the cover as the study continued. There were some very poor readings from the graphs.
(b)(ii) This was the section on the paper where most candidates did not score well. Many candidates described every single fluctuation by quoting data; the overall changes were often ignored. A lot of answers did not include any reference to the time scale. This was particularly noticeable when describing pool C. Many candidates stated that it decreased throughout the study without realising that it remained at almost 100% for the first two months. A significant number of candidates described both species.
(b)(iii) Answers in this section tended to be very vague. Some candidates did not refer specifically to the pools. For pool A, the better candidates referred to the grazing by the periwinkles. In pools B and C, candidates did not refer to the removal or addition of the periwinkles, and the consequent effect upon the *Enteromorpha,* as the grazing pattern changed.
(c) Most candidates were able to gain a mark by referring to the maximum number of algal species at 150 periwinkles per m^2. However, the question expected some explanation. Relatively few candidates attempted to give an explanation.
(d) This was generally a high-scoring question. Even candidates who included some misconceptions were still able to reach full credit. Common misconceptions included references to the whole process as eutrophication and not just the nutrient enrichment idea, algal blooms using up oxygen as they respire more, BOD decreasing as aerobic decomposition increases.

6104 Unit 4 Core Examiners' Report

	Core information for: Option A	Option B	Option C
Maximum mark.....	40	40	40
Mean mark.....	18.5	19.1	17.7
Standard deviation	7.4	7.0	7.6

Question 1

For a relatively straightforward question, this was poorly answered. Many candidates stated that the phytochromes were located in the chloroplasts in part (a), and very few candidates distinguished between the rates of Pr formation in part (b). Marks were lost in part (c) by candidates who did not specify the type of light.

Question 2

This question was reasonably well answered, especially part (c). Some candidates lost marks in part (a) through poor terminology, referring to the impulses as messages or signals, and in part (b) for not being specific enough about the type of neurone with which the dendrites form synapses.

Question 3

In part (a), there were some good comparisons made, although the mark scheme did have to allow for some poor expression of the timings to which the candidates referred. There was still a significant number of candidates quoting figures directly from the table, or discussing the changes that occurred in the diabetic man and then the non- diabetic man separately.

In (b)(i), most candidates could explain how the evidence in the table supported the idea, but few stated categorically that insulin lowers blood glucose levels.

In (b)(ii), most candidates put forward at least one reasonable suggestion. Those who tried to discuss how changes in glucose would effect respiration failed to say whether there would be an increase or a decrease in the rate of respiration.

Part (c) was generally answered very well by those candidates who read the question properly – there were quite a number of accounts referring to the action of insulin. However, many candidates are still writing that glucagon converts glycogen into glucose. Examiners expect reference to, for example, glucagon increasing the conversion of glycogen to glucose.

Question 4

Candidates demonstrated a good knowledge of chemiosmosis and oxidative phosphorylation in part (a), but many failed to link their answer to the formation of ATP at three sites, and therefore only scored three out of the four marks.

Part (b) was also well-answered by the majority of candidates, the most common error was a failure to state that the hydrogen carriers were in their reduced state.

Part (c) was variable. Lack of specificity cost some candidates marks, as they failed to state that it was the matrix of the mitochondria where the reactions took place. A few candidates indicated that pyruvate was converted to acetyl coenzyme A on the inner membrane of the mitochondria.

Question 5

The full range of marks was seen for this question with relatively few candidates scoring zero for this question. In many cases, however, the candidates gained the marks more by chance in amongst very long-winded accounts of the functioning of the kidneys. Frequently seen errors/misconceptions included: confusion over the locations of the medulla and the cortex and the podocytes, glomeruli being part of the nephron, a failure to state that the microvilli were on the cells of the proximal convoluted tubule, using the abbreviations PCT and DCT, and stating that either the collecting ducts, or the urethra, took the urine to the bladder. A number of candidates included diagrams without labels.

6104/01 Unit 4 Option A Examiners' Report

	Option only	Core + Option
Maximum mark	30	70
Mean mark	12.4	30.7
Standard deviation	5.8	12.1

Question 6

The endotoxin / exotoxin answers were variable. Most marks were lost through poor wording; a common error was to state that *Salmonella* and *Staphylococci* were the names of the toxins. Part (b) was well answered by many candidates

Question 7

Part (a) was answered correctly by most candidates, who stated that *Pencillium* is a fungus. Some answers, such as stating 'eukaryote', were considered to be too vague.

Poor wording cost many candidates marks in (b)(i), for example by stating that nothing is added or removed. A surprisingly high number of candidates described continuous fermentation, however. Part (b)(ii) was either well done or totally on the wrong track. A high proportion of candidates stated that batch fermentation was cheaper as not so much product was lost if the batch became contaminated.

In part (c), a reasonable proportion of candidates knew that the penicillin was found in the culture medium, but many failed to take their answer far enough by explaining that the penicillin was released by the mould.

Question 8

Common errors in the calculation included dividing by 20, rather than 22 (mark point 2), using values from the table, incorrect rounding up of the answer, or leaving the number of bacteria as a decimal.

Part (b)(i) caused a number of problems, with many candidates failing either to make comparative statements, or to describe the growth and survival of the bacteria. Many candidates simply listed the numbers of viable cells at each pH in turn. Part (ii) of this question was answered quite variably; often candidates compared the differences in growth and survival in this section instead.

Question 9

Relatively few candidates could name dilution plating as an appropriate method in part (a)(i), with streak plating being a common error. Those who suggested using a counting chamber failed to mention the need for an exclusion dye.

The rest of the question was reasonably well answered, with candidates scoring highly on the graph and recognising that sucrase would need to be synthesised before more growth could occur, using the added sucrose.

6104/02 Unit 4 Option B Examiners' Report

	Option only	Core + Option
Maximum mark	30	70
Mean mark	19.3	38.4
Standard deviation	4.3	10.2

General Comments

Questions 6(b), 7 and all of question 9 were high scoring. Questions 8(a) and (b) proved difficult.

Question 6

There were just as many references to bacteria as there were to fungi in part (a). In part (b) candidates were expected to refer to ethanol specifically, rather than just stating that alcohol is produced.

Question 7

Although many successfully completed the calculation in part (a), a significant number divided 17 by 57 instead of by 74, while others did not calculate the decrease and simply divided 57 by 74. There were some good answers in part (c) with clear descriptions of modified atmospheres, but there were also many candidates who could do no more than refer to low temperature and therefore gain one mark only.

Question 8

Once again the practical based question on this option proved to be the most difficult. It appeared that many candidates had not performed the resazurin test. Parts (a) and (b) were therefore low scoring. In part (b), some described the process of pasteurisation, rather than focusing on the sample of milk undergoing the resazurin test. There were some good answers to part (c), with about half the candidates gaining at least three of the four marks available. Most were able to refer to lactase and what it does when present.

Question 9

In (a)(ii) the majority referred to a relationship between body mass and height, but not all attempts to write the equation were accurate.
Most candidates were able to gain all three marks in (b)(i) for describing the changes in percentages of overweight and obese children. Candidates who failed to gain the maximum often did so because they only made a statement about the general trends and did not go on to support their answer. In (b)(ii) the majority of answers correctly identified high fat intake and undertaking less exercise as reasons for the changes referred to in part (i). There were many references to 'junk' food and computer games. The most common answer in (c) was coronary heart disease, which gained a mark. A vague statement such as 'causes heart problems' was not enough for a mark.

6104/03 Unit 4 Option C Examiners' Report

	Option only	Core + Option
Maximum mark	30	70
Mean mark	14.9	34.2
Standard deviation	4.8	11.3

General Comments

Candidates attempted all sections of the option and many demonstrated a sound understanding of the topics covered by the paper. High scoring candidates selected relevant data to illustrate answers; however the weaker candidates either failed to use the data or used inappropriate data. Some candidates lost marks due to poor expression and lengthy answers which often contained contradictions. The importance of planning answers, after careful reading of the question, is very important.

Question 6

All mark points were seen and many candidates gained 5 or 6 marks on this question. Those who did not, gave lists of features for cardiac muscle and striated muscle but with no attempt to distinguish between the two. Two serious misconceptions seen frequently were: 'cardiac muscle is smooth muscle' and 'striated muscle contains actin and myosin filaments, but cardiac muscle does not'.

Question 7

Parts (a)(i) and (a)(ii) were answered well, with candidates familiar with the B cells dividing by mitosis. The correct spelling of mitosis was necessary to gain the mark, and any suggestion that the word written might be meiosis was not awarded a mark.
In (a)(iii), memory cells were well known although references to these cells 'memorising' or 'able to remember' did not gain credit. Plasma cells were sometimes confused with blood plasma or phagocytic cells.
Part (b) produced some excellent answers, with relevant detail, presented in the correct sequence, and using specific terminology. Weaker responses confused lysosomes with enzymes and indicated that the digestion by enzymes occurred outside the cell.

Question 8

Most candidates recognised the relationship, but were unable to gain full credit as they failed to include units, or select suitable data to illustrate their answers. Many stated that the levelling out was at a minute volume of 50 dm^3 min^{-1} rather than at 60 dm^3 min^{-1}. The three stages shown on the graph from the age of 30 years were not always referred to using the correct year, and therefore full credit was not awarded.
The calculation was straightforward but some candidates did not work out the percentage increase, just the overall increase.
Part (b) was specifically about oxygen uptake and candidates were expected to relate cardiovascular changes linked to the lungs. Most stated correctly that stroke volume increased, or that training lead to increased capillaries in the lungs, but fewer referred to the increased number of red blood cells or increased haemoglobin.

Question 9

The reading and the interpretation of the graph proved difficult for many candidates with the peak density frequently given as 25 years. The values taken from the graph were frequently inaccurate or vague. The better candidates were able to pick up all the marks, by clearly comparing the linear decline in men and the variable rate of decline in the bone density of women.

6105 Unit 5B Examiners' Report

Maximum mark 70

Mean mark 37.5

Standard deviation 10.4

General Comments

Overall, the standards achieved by candidates on this paper were very similar to those of June 2005. Questions 2, 5 and 7 were particularly mark yielding. Questions 4 and 6 were the least well answered questions.

As in previous examinations, there were a substantial number of scripts that were very difficult to read. Candidates must be reminded of the need to write clearly in order than their responses can be read by the examiner. Squeezing in extra lines of writing does not help legibility and is often unnecessary. The space provided on the examination paper should be sufficient and often those candidates who use up a lot of extra space are not answering the question. The examiners also noted an increase in the number of unanswered sections. Candidates should be reminded that it is good examination practice to attempt to answer all the questions, rather than leave blanks.

Question 1

This was a very straightforward opening question and many candidates gained all four marks. However, examiners noted that spelling was often poor and some candidates could not spell plantae, for example, writing plantan or even plantain instead.

Question 2

This was well answered. The majority of candidates had a good knowledge of genes and alleles. Most concluded correctly that the allele is dominant and were able to work out the genotypes and probability in (b)(iii). Weaker candidates had difficult explaining the reason for the allele being dominant. A few decided that the gene was sex-linked, while others chose to use a completely different notation from that requested in the question. In part (c), most gained full marks by referring to mutations and giving examples of mutagens, or by describing the inheritance of a recessive allele.

Question 3

There were some good descriptions of active transport in part (b) although a few confused facilitated diffusion and active transport. Most gained the mark in part (c), although there were a few that forgot the P in NADP. Part (d) was disappointing and it was clear that many candidates were not familiar with this experiment. The mark scheme was quite open to accommodate various methods, but even so many gained just one or two marks. Few could describe precise measuring techniques and simply stated that growth should be observed. Very few candidates were clear about controls and variables.

Question 4

Responses to this question were disappointing, despite the inclusion of a number of clues in the stem of the question. In part (b), few candidates mentioned phospholipids, although most were able to explain that membranes in the mitochondria would be damaged. Responses to part (c) were disappointing. This question has been asked many times before and answers have been good. This time the majority of candidates failed to mention DNA, there was confusion between bases and amino acids, and between enzyme and substrate. More candidates referred to ROS than superoxide.

Question 5

The topic of teeth is examined frequently in the 6103/03 paper so it was surprising that a number of candidates failed to identify the teeth. In order to show progression from AS, candidates had to identify, and describe the shape and function of the tooth for a mark. Examiners were looking for precision in the responses, for example 'long, pointed canines for gripping prey' rather than 'the canines are for killing prey'. Part (b) was very accessible and high scoring. In part (c), very few candidates realised that a smaller territory would lead to an increased fox population. The topic of speciation had been examined in June 2005 when there were some excellent responses. Therefore, it was quite surprising to read the poor accounts of speciation on this paper. Good answers were few and far between. Most responses were jumbled and confused, with terms such as allopatric, sympatric and reproductive isolation, included almost at random. Few candidates mentioned allele selection and gene pools.

Question 6

Part (a) was an easy and accessible question and many candidates gained full marks. Weaker candidates failed to mention shape or overlooked the idea that the active site was blocked. Part (b) was generally well answered. The synapse is a well understood topic but it was frustrating to see some candidates wasting time and space describing the whole process, from the arrival of the action potential at the synapse, rather than focussing on the role of acetylcholine. Candidates' understanding of the function of acetylcholinesterase was weak. Few candidates realised that inhibition would lead to over-stimulation and there were many generalised accounts about nervous systems being destroyed, or not functioning. In part (c), most candidates were able to give two good reasons for using chemical control. Some overlooked the fact that the control was need in a store and not in a field. In (d), the responses were quite muddled.

Question 7

This was well answered, with the exception of part (a). As in previous examinations, candidates struggled to explain the term 'gross primary production'. Candidates generally gained either one or three marks for the calculation. The majority could do the first part, but most decided to divide 35 by 180, and so gained just one mark. Parts (b)(ii) and (iii) were relatively easy and high scoring. It was pleasing to read the responses on sustainable forests in part (c). The first time this topic was examined, it was very poorly answered. This time, the candidates understood the process of replanting forests, selective felling and the use of rotational coppicing to ensure a sustainable harvest.

6115 Unit 5H Examiners' Report

Maximum mark 70

Mean mark 30.3

Standard deviation 10.6

Question 1

There were many completely correct or almost completely correct answers. Relatively few candidates were unable to score any marks at all. A common mistake was to give 'apes' only in the first box, rather than 'humans and apes', as an alternative to hominoids.

Question 2

Common with 6105

Question 3

The answers to this question were generally disappointing and relatively few candidates scored well on every section.
In part (a), very few candidates referred to the sagittal crest. The most common answer in part (b) was a reference to the angle of the hip or the shape of the pelvis. Many candidates stated that there would be differences in the length of the legs or arms. Part (c) was generally a poor section with some very vague answers. However, there were some very good answers that described how the reduction of forests, and the increase in grasslands, favoured bipedal walking. In part (d), there were some very good and detailed accounts. Some candidates are confused as to when there is heating and when there is cooling. A number of candidates left this section blank.

Question 4

Common with 6105

Question 5
The topic of teeth is examined frequently in the 6103-03 paper so it was surprising that a number of candidates failed to identify the teeth. In order to show progression from AS, candidates had to identify, and describe the shape and function of the tooth for a mark. Examiners were looking for precision in the responses, for example 'long, pointed canines for gripping prey' rather than 'the canines are for killing prey'. Part (b) was very accessible and high scoring. In part (c), very few candidates realised that a smaller territory would lead to an increased fox population. The topic of speciation had been examined in June 2005 when there were some excellent responses. Therefore, it was quite surprising to read the poor accounts of speciation on this paper. Good answers were few and far between. Most responses were jumbled and confused, with terms such as allopatric, sympatric and reproductive isolation, included almost at random. Few candidates mentioned allele selection and gene pools. In part (d), many answers included reference to the desired docile nature, but only better candidates could gain further credit for references to, for example, ease of care, or herding (in grazing animals).

Question 6

Common with 6105

Question 7

Common with 6105

6106/01 Unit 6 T2 Individual Study Examiners' Report

Maximum mark 32

Mean mark 18.9

Standard deviation 4.8

General Comments

The wide range of interesting investigations and the considerable amount of time and effort that has clearly been put into their preparation and execution continues to impress examiners. These reports have always sought to offer advice on the interpretation of the criteria in order to make such efforts more productive. The majority of the detailed comments made in the June 2005 report are also relevant to this examination and all Centres are advised to review these carefully.

Some points for Centres planning A2 coursework

- Always consider the actual outcomes of your approach. If it is likely that many candidates will produce reports with many similar features then examiners will not be able to support higher marks.
- Will the methodology used yield data of A2 level standard?
- Will the investigations allow candidates to independently select methods of data presentation and analysis?
- With very large groups it is likely there will be some overlap in titles of investigations, but these must show the range of variation which would be expected of independent work.
- More enzyme investigations are best avoided. Examiners will expect a high level of sophistication to demonstrate progression from AS.
- Do not allow candidates to investigate ideas without some sound biological background and control of major variables. For example, investigating mouthwashes without any indication of ingredients or concentrations.

The following points are intended to help candidates to avoid some common pitfalls.

Planning

- Do include important phrases linked to statistical analysis in your hypothesis e.g. 'significant correlation' or 'significant difference'. Not only does this indicate the type of statistical test which might be employed but also suggests the nature and type of data to be collected.
- Try to use the techniques you may have learned in ecology to investigate an interesting question rather than copy part of a demonstration or investigation you have seen.

Introduction

- Select the information you have researched carefully to support your hypothesis rather than applying an 'all I know about…' approach.

Method

- Make sure your method account meets requirements. Can a stranger read your account and repeat your investigation exactly?
- Have you included full details of how you attempted to control most important variables? This is equally important in ecological investigations, where it is often

important to select sites for investigation which at least mitigate the effects of important variables, rather than introducing new ones.

Analysis

- Keep graphs to a minimum, but make sure you have drawn the one which matches your hypothesis and helps you to draw conclusions about it.
- Remember sample number is almost always unacceptable as an axis on your graph.
- Describing trends and patterns must include an overall picture of what is happening in your data not just a simple description of the values in your table.
- Your planning should mean that you do not need to do more than one statistical test. You may use computer programs to calculate values but their interpretation must be in your own words and include reference to 5% confidence limits.

Discussion and Evaluation

- Make sure that explanations of conclusions do not mean simply copying large sections of your introduction. It is vital to link your biological theory to the actual data you have collected.
- There are often limited attempts to consider variability and its effects on reliability. Always start by reviewing your data and describing how much different readings or repeats vary. Try to think why your repeats are not identical and what any large differences tell you about how well you are controlling your variables.
- Thinking in this way should enable you to comment on shortcomings of the actual experimental design, without admitting to gross errors or poor skills.

Style

- An abstract should be short but include all the parts listed in the criteria.
- You should think of including more references than a few internet sites.
- Be sensible when selecting websites. Not everything on the internet is a reliable academic source.
- Make sure you indicate in your report exactly where you have used the references you have quoted.

6106/02 Unit 6 W2 Written Alternative Examiners' Report

Maximum mark 38

Mean mark 14.1

Standard deviation 4.1

General Comments

The examiners would like to stress once again that the principle of this paper is to provide an alternative means of assessing the practical skills criteria for A2 as listed in the subject specification. The best preparation for the examination is therefore to carry out a range of investigations which can be used to practise these skills.
There is a significant minority of candidates who appear to be relying solely on rote learning of past mark schemes. This often manifests itself by selection of graphical formats in question1 which have little regard for the data listed, or inclusion of inappropriate techniques in question 2 part (a).
The examiners will always attempt to apply mark schemes in such a way that a clear understanding of the principles of planning scientific investigations, analysis of data and evaluating will be needed for higher marks.

In this paper, question 1 part (d) sought to test Discussion and Evaluation (b) for the first time, and it is likely that the examiners will seek to widen the type of questions to test all of the practical skills criteria in future papers.

Question 1

(a) Many candidates are now familiar with this type of data presentation and there were some good attempts at tally charts with suitable size classes.

(b) There were some good graphs gaining high marks, but a number failed to distinguish between bar charts and histograms.

(c) Those who were familiar with interpretations of confidence limits gained maximum marks. The examiners expect references to 5% confidence limits and 'significant' differences.

(d) This new question drew a variety of responses. Some were determined to answer a different question from previous papers, whilst those reading the question carefully gave a range of acceptable responses, although rarely for more than one mark. It was evident that few candidates had experience of this important scientific skill.

Question 2

(a) The mark scheme made allowance for a wide range of approaches. Those who understood the principle, and considered investigating a correlation between the pollen in the droppings and number of flower visits, quickly gained marks in their plans. Higher marks were limited by a lack of detail in all techniques. There were some very straightforward marks for preparing the pollen for microscopic investigation, although these were rarely mentioned.

(b) There was a very wide range of suggested tables and methods of analysis. As in previous years, examiners match these carefully to the proposed method, but they expect a high standard of organisation and labelling. It is especially important that, where repeats are

suggested in the plan, the table is designed to reflect this, so that all raw data could be recorded. Suggestions for null hypotheses need to be worded accurately, as vague phrases such as 'relationship', rather than correlation, are not accepted.

(c) Many were able to suggest sensible further investigations, but a detailed evaluation of the techniques employed, describing important limitations, was much more discriminating.

6106/03 Unit 6 Synoptic Examiners' Report

Maximum mark 38

Mean mark 21.4

Standard deviation 5.3

General comments

Synoptic questions are written 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 in order to answer the questions correctly. Candidates are also being tested on their ability to select relevant information.

This June's synoptic paper was, in general, an accessible and high-scoring paper and there were some excellent attempts where candidates successfully applied their knowledge and understanding to the questions. Questions 3 and 4B were approximately equally popular; only a relatively small percentage of candidates attempted question 5H.

Question 1 part (b)(ii) proved to be discriminating; question 1 (c), and question 2 parts (b) and (d)(ii) were high-scoring. Candidates generally found difficulties with question 2 parts (a) and (e). As noted with some of the other unit tests, many of the answers showed a lack of selection of relevant material in answering the question. For example, answers to question 1 (a) frequently contained irrelevant (and sometimes inaccurate) information about the structure of haemoglobin. The answers to question 2 (b) at times digressed into accounts of the advantages and disadvantages of biological control.

The general standard of the essays was as variable as ever. Some essays gave carefully thought-out, coherent accounts, with detailed and relevant material. On the other hand, many were poorly organised lists of information, sometimes written with sub-headings, numbered points, or as short notes. Candidates are reminded that the essays are expected to be written in continuous prose, with an introduction and a conclusion. Candidates are also reminded in the rubric that they should include relevant information from the whole of the course.

Question 1

Answers to part (a) were rather variable, the most common response was a reference to the reversible nature of the association of haemoglobin with oxygen. There was some confusion about the number of oxygen molecules carried by one haemoglobin molecule and it was also clear that some candidates consider haemoglobin to be synonymous with a red blood cell. A number of candidates included irrelevant detail about the structure of a haemoglobin molecule but may, subsequently, have gained credit for explaining why haemoglobin is an efficient respiratory pigment. The majority of candidates read the figures accurately from the graph in part (b)(i). Errors in reading from the graph were sometimes due to carelessly drawn freehand

lines which, almost inevitably, gave incorrect values. Part (b)(ii) gave an even spread of marks, with approximately one-quarter of candidates showing a clear understanding of the significance of the higher affinity of fetal haemoglobin, than maternal haemoglobin, for oxygen. Some of the weaker answers suggested confusion between partial pressure and hydrostatic pressure. Overall, this part of question 1 proved to be a good discriminator. The majority of candidates answered part (c) well. Errors were sometimes related to giving the probability of a baby affected with HPFH, rather than the probability of a baby being a carrier. Some candidates gave complete sets of genotypic and phenotypic ratios and probabilities but, nevertheless, included the correct answer and were given credit accordingly.

Question 2

Many of the explanations of the term genetically modified organisms were vague and imprecise and did not distinguish between genetic modification, mutation, or selective breeding. Only a relatively small number of candidates gained both marks here, usually for indicating the transfer of DNA, or a gene, by the technique of gene technology. By contrast, the majority of candidates gained marks in part (b) for references to predatory insects eating pest species, and thus reducing damage to crop plants. Some candidates clearly did not understand the term predatory in the question, and referred to these insects as herbivores. There was a tendency to give superfluous information about the advantages and disadvantages of biological control, which was not relevant to the question.

There were some good answers to part (c), showing that candidates understood the roles of herbivores and decomposers in food chains and were able to apply their knowledge correctly. Some of the explanations were, however, rather vague. For example, when referring to decomposers, it was expected that candidates would refer to the breakdown of organic remains. However, if this point was not made, many candidates gained credit for a reference to the release of nutrients. The answers to part (d)(i) were surprisingly variable, possibly reflecting candidates' experience and understanding of quantitative field techniques. A number of candidates correctly described random sampling and the use of a quadrat, but went on to describe methods for the determination of biomass, rather than the density in terms of numbers of weeds per unit area. The majority of candidates gained both marks in (d)(ii) by correctly identifying GM maize, and supporting their answer with a suitable reason from the information provided. Answers to part (e) were generally less successful as many answers did not refer to environmental effects. Some candidates were clearly aware of the possible consequences of gene transfer to other species, but it was disappointing to note that many candidates suggested that herbicides cause eutrophication or even acid rain.

Question 3

Many of the attempts at this question included details of membrane structure and related the properties of phospholipids to membrane permeability. The majority of candidates included descriptions of diffusion, facilitated diffusion, osmosis and active transport, but relatively few described osmosis in terms of a water potential gradient. There was also a tendency to refer to movement 'along' a gradient, rather than indicating more precisely whether movement occurs down, or against, the concentration gradient.

The major weakness in the answers to this question was the lack of any synoptic content. Although the membrane transport processes may have been described adequately, in a number of cases there were few, if any, specific examples. It was expected that the membrane transport processes would be exemplified with references to, for example, the nephron and axon membrane.

Occasionally, where these were included, they were passing references and often inaccurate. Some of the essays digressed into transport in general, usually with descriptions of pathways for the movement of water in roots, or transpiration. Good essays included accurate explanations of membrane transport processes, illustrated with references to reabsorption of both solutes and water in the nephron, active and passive transport of ions across the axon membrane, and the release of transmitter substances by exocytosis.

Question 4B

The majority of attempts at this question included references to the visual pigments and to phytochrome; relatively few also included the detection of light direction and the role of auxin. There was a tendency here to include details of the absorption of light by the chloroplast pigments, then to digress into accounts of photosynthesis. In general, the visual pigments were better understood than phytochrome and some of the essays included good details of the structure and function of rods and cones. There was some confusion about phytochrome and the interconversion of Pr and Pfr. Some candidates referred only to Pr and Pfr, without explaining what these abbreviations mean, or indicated that, for example, Pr is the same as red light.

There were some very good, detailed essays on this topic, with accurate descriptions of rods and cones, balanced with the detection of light in flowering plants by phytochrome pigments. These accounts were often illuminated with reference to photoperiodic effects in flowering plants, or the germination of light sensitive seeds.

Question 5H

Some of the essays on this topic included outlines of meiosis, gametogenesis and fertilisation, but often included only superficial information from unit 5H on the detection of fetal abnormalities by amniocentesis. Nevertheless, there were also some very good accounts including appropriate facts from both units 2H and 5H, with details of the preparation and interpretation of karyotypes. It was gratifying to note that some of the better essays also included references to the social and ethical implications.

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	39	34	29	25	21
6102 Unit 2B	60	41	37	33	29	25
6112 Unit 2H	60	39	34	29	25	21
6103 Unit 3	70	53	46	40	34	28
Paper 01 T1	*32*	*26*	*22*	*18*	*15*	*12*
Paper 03	*38*	*27*	*24*	*22*	*19*	*16*
6103 Unit 3 (International option)	70	46	41	36	31	26
Paper 02 W1 International only	*32*	*19*	*17*	*14*	*12*	*10*
Paper 03	*38*	*27*	*24*	*22*	*19*	*16*
6104 Unit 4 Option A	70	44	39	34	29	24
6104 Unit 4 Option B	70	49	45	41	37	33
6104 Unit 4 Option C	70	46	41	36	32	28
6105 Unit 5B	70	48	44	40	36	33
6115 Unit 5H	70	47	42	38	34	30
6106 Unit 6 (Option 1)	70	50	45	40	36	32
Paper 01 T2	*32*	*24*	*21*	*18*	*15*	*12*
Paper 03	*38*	*26*	*24*	*22*	*21*	*20*
6106 Unit 6 (Option 2)	70	44	40	36	32	29
Paper 02 W2	*32*	*18*	*16*	*14*	*11*	*9*
Paper 03	*38*	*26*	*24*	*22*	*21*	*20*

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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