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GCE

Edexcel GCE

Biology (8040/9040)

Biology (Human) (8042/9042)

This Examiners' Report relates to Mark Scheme Publication code: UA016324

Summer 2005

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Examiners' Report

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

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

6101 Unit 1 Examiners' Report

Maximum mark 60

Mean mark 32.5

Standard deviation 10.8

General comments
Questions 1, 2, 3(a) and (b), 5(c) and 6(c)(ii) were high scoring. Questions 4(b), 5(a), 7(a)(ii) and 8(b)(i) and (b)(ii) were low scoring. Of these low scoring questions, 4(b) and 8(b) required candidates to read and interpret the information provided while 5(a) and 7(a)(ii) were both related to practical techniques.

Question 1
A significant number of candidates were able to gain full marks in part (a). Some answers, however, did not include both monosaccharides present in lactose. In part (b) it was pleasing that the majority of candidates were able to name the bond that was present between two monosaccharides.

Question 2
Many candidates performed well on this question, demonstrating a good knowledge of the protein structure. Some referred only to helix rather than alpha helix when describing secondary structure and some used the term double helix. There was little reference to R groups in relation to tertiary structure.

Question 3
In part (a) about half of the candidates correctly labelled all three parts but some referred to chlorophyll rather than chloroplast. A significant number of candidates disappointingly identified part C in the bacterial cell as a nucleus. Many candidates were able to give a difference between the cell walls in part (b) and while most candidates achieved the first point in part (c) for enabling movement, very few attempted to give a reason for the movement.

Question 4
Many candidates seemed familiar with the names of the molecules in part (a) (i) and (ii) but only a few candidates could give a correct function of the glycoprotein. There were some very good answers in part (iii) and the majority of candidates were able to make suitable references to hydrophobic and hydrophilic properties.
A lot of candidates could not interpret the information in part (b). Many candidates made no attempt to answer the question while others gave irrelevant descriptions about transport across the membrane.

Question 5
The technique referred to in part (a) remains one that a significant number of candidates are not familiar with. Marks were mostly gained for referring to the name of a suitable stain or for squashing under a coverslip. Some candidates referred to the points that examiners were looking for, but not in the correct sequence.
In part (b) the majority of candidates were able to use the data to identify the longest and shortest stage. A good number of candidates also successfully compared two phases by manipulating figures and this was most encouraging. However, many candidates simply quoted percentages and made no reference to time at all. Most candidates gained both marks in part (c).

Question 6

Although many candidates gained a mark in part (a) for explaining magnification only a few candidates could give an appropriate statement about resolution with many candidates referring to clarity.

It was pleasing to note that many candidates were able to correctly complete the calculations in parts (b) and (c)(i). This was an area of the specification that had not been tested before in this way.

When required to make a drawing of something that can be seen in a photograph, some candidates include structures that are not visible in the original photograph.

Question 7

In part (a)(i), although most candidates knew a buffer could be used to control pH only a few candidates could identify that the area of the cloth was important for controlling the volume of substrate.

A vast majority of candidates were unable to accurately describe a control in part (a)(ii). The most common approach was to leave out the buffer rather than the enzyme.

In part (b) many candidates correctly referred to a change in shape of active site and that this affected the enzyme-substrate binding. However, statements about denaturation were often not in a suitable context.

Part (c) was very well answered, with many candidates scoring between 3 to 5 marks or full marks. Candidates seemed to have a good understanding of the structure of both amylase an amylopectin with clear references to bonding and shape.

Question 8

In part (a), drawings ranged from very poor to excellent. Candidates who did draw it well showed a clear stack of cisternae. Many candidates also drew vesicles close by and labels were correct. However, some candidates drew what looked like vesicles but labelled them ribosomes. Cisternae were sometimes incorrectly labelled cristae. Others put ribosomes on the cisternae.

In part (b)(i) most candidates described the radioactivity decreasing and therefore obtained the first mark. However, not many candidates were able to go on and give a reason why there was a decrease. A significant number of candidates made no attempt to answer question (b)(ii). Those who did give an answer often just described the results rather than explain them. Explanations that were seen usually only made references to radioactivity moving and did not refer to proteins. Some candidates could make a reference to formation of vesicles with protein in them (point five on the mark scheme).

6102 Unit 2B Examiners' Report

Maximum mark 60

Mean mark 32.7

Standard deviation 11.1

General comments
The usual wide range of responses was seen to this Paper, from those candidates with a sound knowledge and understanding of the specification, to those for whom most, or all, of the questions proved to be difficult to answer successfully.

In general, candidates coped well with questions 1, 2(b), 7 and 8(a)(iii). There were also many good answers to question 8(b). Answers to the other questions were more variable; in particular, many candidates found questions 2(a), 4(b), 5(a)(i), 6(c) and 8(a)(i) difficult. In a number of cases, marks were lost by candidates failing to read and assimilate information given in the questions, and including irrelevant details in their answers. In many cases candidates' answers were poorly expressed.

Question 1
The majority of candidates coped well with this question and gained good marks. One common error was naming 'phagocytes' as a specific type of leucocyte. Some candidates also found it difficult to select an appropriate word to describe the shape of a lymphocyte nucleus.

Question 2
Part (a) of this question was often answered more successfully than part (b), where candidates were able to give a more accurate account of myoglobin than of haemoglobin. In part (a), many candidates gave descriptions of the structure and properties of red blood cells but were, nevertheless, sometimes able to score marks for incidental references to the properties of haemoglobin. There were, however, a number of good answers including references to the reversible nature of the affinity of haemoglobin for oxygen, its ability to transport carbon dioxide, and descriptions of the Bohr effect.

Many candidates were able to describe the role of myoglobin as a store of oxygen and referred to the release of oxygen at very low partial pressures of oxygen. There were also a number of good descriptions of the transfer of oxygen from oxyhaemoglobin to myoglobin.

Question 3
In part (a), the majority of candidates correctly named Stage B as ventricular systole, but the answers to part (b) were more variable. Many of the answers gave complete accounts of the cardiac cycle and its coordination, rather than focusing specifically on the events during complete cardiac diastole. In part (c), there were some good descriptions of the coronary circulation, but also a number of inaccurate descriptions of the circulatory system in general. Many candidates scored at least one mark for an appropriate reference to the coronary arteries. However, some candidates made references to the heart being 'surrounded with capillaries', where it was expected that candidates would indicate that the capillaries are within the cardiac muscle.

Question 4

In part (a), many candidates incorrectly identified cell structure A as a villus but, in a number of cases, were able to gain good marks for the rest of this part. Candidates were asked to explain how these parts assist in glucose absorption, but this was ignored by a number of candidates who gave general descriptions of the functions of microvilli and capillaries.

Answers to part (b) frequently showed that candidates had not assimilated the information provided in the introduction; notably that the concentration of glucose in the solution was lower than the concentration of glucose inside the epithelial cells. Consequently, there were a number of descriptions of uptake by diffusion. There were, however, a number of good accounts in which candidates recognised that the uptake of glucose was against the concentration gradient and correctly described active uptake. Many candidates gained a mark for a simple reference to the increase in glucose concentration in the cells; it was also pleasing to note that some candidates interpreted the graph as showing a constant rate of uptake.

Question 5

Part (a)(i) proved challenging for many candidates, who found it difficult to describe the relationship between depth and the concentration of dissolved oxygen. This may be because the information in the graph was presented in an unfamiliar way, but nevertheless candidates are expected to be able to interpret and translate data from one form into another. Many of the answers were poorly articulated and it was not always clear, for example, whether candidates were describing an increase, or a decrease in depth. Part (a)(ii) was generally answered more successfully than part (a)(i) and candidates frequently gained marks for references to the presence of a respiratory pigment, or a breathing tube.

Part (b) of this question was intended to test candidates' understanding of the relationship between the external features of an organism and the physical characteristics of a specific habitat. Candidates almost invariably gained marks here; usually for references to the presence of a either a tail, or gills, in relation to the aquatic habitat.

Question 6

In part (a), although many candidates referred to the anther, there were also a number of incorrect references to pollen grains. Part (b) was usually answered correctly, although various other stages of meiosis were also seen. Answers to part (c) were very variable. This is another question in which candidates appeared not to use the information provided, as many of the chromosome numbers candidates gave were based on a diploid number of 46, or another number, rather than 14. Several candidates, who gave the correct number of chromosomes in the female gamete, the zygote nucleus and the endosperm cell, incorrectly indicated that the pollen tube nucleus is diploid.

Question 7

Many candidates identified the tissue correctly in part (a)(i) and gave good descriptions of gas exchange in part (a)(ii), including references to the air spaces and diffusion of gases. Relatively few candidates commented on the irregular shape of these cells as a reason for their increased surface area, and some answers included irrelevant details about the lower epidermis and stomata.

In part (b)(i), there were many correct suggestions that the volumes of carbon dioxide and oxygen are the same, but some candidates incorrectly assumed that the respirometer was being used to investigate photosynthesis. In part (b)(ii), marks were sometimes lost by careless subtraction, or by failing to include the units, but many candidates gained full marks for this part.

Question 8

Part (a)(i) was rarely answered correctly and a number of candidates did not attempt this part. Answers to part (a)(ii) were also very variable. Although many candidates identified this correctly as a Graafian (or mature) follicle, there were many other suggestions, including tertiary follicle. The hormones secreted by the corpus luteum were, however, more familiar to the majority of candidates and many gained both marks here.

Answers to part (b) frequently contained detailed accounts of the events leading to fertilisation, with the process itself described, in some cases, almost as an afterthought. Candidates frequently gained marks for indicating that fertilisation occurs in the fallopian tube, and for describing the release of enzymes from the acrosome. References to the fusion of sperm and egg membranes, and fusion of sperm and egg nuclei were seen on a minority of scripts. Some of the answers to part (c) were rather vague, referring to, for example, the transfer of nutrients, oxygen and waste products but without any clear indication of which way the transfer occurs. Nevertheless, there were also some very good answers to this part, including most of the points on the mark scheme, and gaining full marks.

6112 Unit 2H Examiners' Report

Maximum mark 60

Mean mark 27.3

Standard deviation 11.8

General comments
Questions 1, 2, 3, 4 and 8 on this Paper were common between 6102 and 6112 and the standard of answers was considered to be comparable. As with 6102, a wide range of responses was seen. One topic which seems to cause particular difficulties for candidates is the regulation of body temperature and the answers to question 5 were generally poor. Candidates also found it difficult to express their ideas accurately in question 6 part (b) and, in question 7 part (a), there was some confusion between breathing rate and pulse rate.

Questions 1 to 4
Common with 6102

Question 5
There were some good answers to part (a), in which candidates accurately compared the changes in temperature, although a number of candidates stated incorrectly that the temperature of the hand in air remained at 26 °C. Many candidates struggled to give accurate physiological explanations for the differences in temperatures and it appeared that a number of candidates did not appreciate the fact that the volunteer was immersed in water at 10 °C. Some of the answers to part (c) included references to vasoconstriction, but sometimes the context was poor, suggesting that the meaning of this term was unclear. However, there were also a number of correct references to shivering and the consequent generation of metabolic heat.

Question 6
The majority of candidates correctly identified the type of cell division in part (a), although this was not always supported with an appropriate reason. Answers to part (b) were often poorly expressed, using inaccurate words, such as 'exchange of information' between chromatids. Although many candidates recognised that pairing of chromosomes occurs during prophase I, this was not always qualified with reference to homologous chromosomes. Part (c) was often answered correctly.

Question 7
In part (a) many candidates gave descriptions of a method for finding the pulse rate, rather than for finding the breathing rate. The majority of candidates gained one mark in part (b)(i) for describing the relationship between walking speed and the pulmonary ventilation rate. It was pleasing to note that many candidates also qualified their description with an appropriate quantitative comment and gained both marks. In part (b)(ii), many candidates attempted to explain the mechanism in terms of an increased demand for oxygen, rather than as a consequence of the increased production of carbon dioxide. However, one mark was usually gained for a reference to the respiratory centre, or to the medulla.

The standard of answers to part (c) was very similar to the standard of the equivalent calculation in 6102. A number of candidates incorrectly divided the difference by 72, but were, nevertheless, given credit for their consequential error.

Question 8
Common with 6102

6103/01 Unit 3 T1 Individual Investigation Moderators' Report

Maximum mark 32

Mean mark 20.1

Standard deviation 5.6

General comments

Most centres' candidates undertook investigations that could fulfil the coursework criteria, but the quality with which they were carried out was very varied. Nevertheless the general standard was similar to that of last year. When broken down by skill area, however, Planning and Implementing were somewhat improved, whereas Analysing and Evaluating were not.

It was found that many able candidates played safe in their investigations by choosing hypotheses that were mainly about proof of well-known facts. Occasionally, coursework of this type led to the reinforcement of misconceptions about enzyme-controlled reactions, particularly about the effects of temperature and substrate concentration, and subsequently, to poor Analysing and Evaluating sections. On finding results that did not fit the expected pattern, this type of candidate took further measurements until they did fit rather than commenting on this in their work.

Annotations improved this year, but more centres filled in *pro formas* which they had devised, rather than providing full comments in the body of the report. In a minority of cases, the only marks on a script were the four totals for the various skills. In such cases, in the future, work may be returned for marking, especially where the U9 Report from a previous session comments about this. It is important to note that centres in which annotations are sketchy at best are those whose marks are most unreliable. Finally, there are centres that still do not recognise the hierarchical nature of the assessment criteria, so that marks are not awarded at a particular level, when a candidate's work contains omission(s) at that level.

The vast majority of centres recorded marks with which moderators agreed, but there were quite a number who awarded highly inflated scores for some investigations, but not for others. Centres are reminded that whilst moderators record marks for a sample of scripts, it is all the candidates from the centre that may be affected by the over-inflated scores of a few.

Most centres used the up-to-date Record Sheets, but many did not. There is a requirement for two signatures on each sheet, one for the teacher and the other for the candidate. The relevant Record Sheet may be found in the most recent copy of the Specification or by logging on to www.edexcel.org.uk and following the route through *Qualification* ~ GCE, *Subject area* ~ Biology/Biology (Human), *AS GCE* ~ Biology, then look under *Guides* and click on the link *Record Sheet*.

Planning

There was evidence that many candidates' plans are not being checked before the candidates are allowed to proceed. It is important that checks are made at this stage, so that candidates are given the opportunity to make changes, in order that the planned measurements are likely to yield data suitable for Analysing and Evaluating at the highest level. Candidates need guidance on the acceptability of their plans.

Sufficient, relevant biological knowledge and adequate control of variables remain limiting factors in Planning. For example, candidates describe everything they know about enzymes, without sufficient detail about the variable being investigated. Often variables are mentioned in the procedure, but there are no specific statements about variable control itself. Candidates are strongly advised to provide a separate section on this aspect.

Risk assessments are much improved, but for 8 marks these must be linked to the specific procedures and chemicals used.

Implementing

There were still problems moderating this section as many centres failed to provide information about a candidate's performance. Moderators expect to see notes on sub-sections (a) and (b). Absence of these may limit a candidate's marks overall, especially if the only evidence in the work is a table of raw data. For the award of higher levels the investigation must normally allow for the demonstration of manipulative skills and yield sufficient data. In many investigations at AS, three or possibly more repeats will be required.

Analysing

Graphical presentation was better than in previous sessions, but lack of selectivity remains a problem. Centres are reminded of the Institute of Biology's recommendation that '*a smooth curve should only be drawn if there is good reason to believe that intermediate values fall on the curve […] otherwise, straight lines joining points should be drawn'*. Drawing a curve or line of best fit may hide important trends and patterns exhibited by the data. Large numbers of candidates drew error (range) bars to show variation in the data, however 8 marks cannot be awarded unless more basic skills, such as plotting and line drawing, are also fulfilled satisfactorily. Many centres' candidates calculated standard deviations from three repeats. There is little point in doing this; range bars are certainly much more informative at this level.

Many, better candidates failed to score the higher marks for their descriptions of trends, patterns and anomalies. This was mainly because trends and patterns were incompletely and/or superficially described, so that a mark of 6(b) could not be awarded.

Finally, the biological support for the results often limited the marks for Analysing. Sometimes this was because of a failure to describe in biological terms the trends candidates described, but most frequently because the explanations offered were based on incorrect science. Candidates who obtained unexpected data frequently failed to explain them in any meaningful way. This was unfortunate, because it is at stages such as this that candidates can really begin to engage in scientific analysis and thus score the highest marks in this section.

Evaluating

Many candidates still appear uncertain about what is required in this skill. Sensible comments on the reliability of the data or the accuracy of the techniques used were rare. Many candidates listed experimental errors or problems that should have been eliminated in the Planning stage. Many candidates' difficulties were of the general kind and failed to address those difficulties actually experienced during their own investigations. Limitations were rarely described or explained. These might be related to the instruments used (provided that they were appropriate to AS-level).

Whilst error bars appear more frequently in graphs, most candidates did not understand the need for them. These need to be used to comment on the reliability of the data and the conclusions reached.

It is in Evaluating, that moderators' and centres' marks differed most widely. Centres frequently gave high marks when one of the sub-sections was distinctly weak. Usually, this was because E (a) was credited with 6 or 8 marks when the words reliability and variability had been used in a very short paragraph, which described these terms in a very general sense. These ranges of marks are too generous.

Further work must be linked to the original hypothesis, which demands close attention to the variable investigated. Candidates do not gain credit by launching into completely new studies.

Finally, some candidates wrote a general 'conclusion' covering Analysing and Evaluating, with E (a) omitted. These two areas are best addressed separately.

Administration

Reminders:

Do hold sheets for each report together with a treasury tag. Please do not enclose reports in transparent pocket files or organise them in bulky folders.

Do annotate coursework.

Do use Report Sheets with spaces for teacher and student signature.

6103/01 Unit 3 W1 Written Alternative Examiners' Report

International Only

Maximum mark 32

Mean mark 16.4

Standard deviation 5.2

General comments

Once again, question 1 produced some very good answers, which were generally better than those in question 2. Nevertheless, in this second question, candidates were much more focused than in the past on providing relevant, experimental detail. Overall, the standard was much better than last summer.

Question 1

(a) Most candidates successfully completed the table. For those who did not, the most common errors were:
- Units included with the data
- Rounding errors when calculating percentages
- Missed figures for distilled water

(b) Most graphs were correctly formatted, with precise plots and accurately drawn lines. However, a surprisingly large number contained axes errors more usually on the x-axis with a non-uniform scale.

(c) Few candidates clearly identified two of the three marking points. A large number merely described every event and did not score at all. The most common response focused on the maximum effect at 0.05 mol dm^{-3}.

(d) Similar to last year, references to the hypothesis were rare. Many answers just repeated part (c). It was rare to see two correct points. Candidates appeared to be very uncertain about their responses, which should have related not only to the initial hypothesis and to the data, but also to the biology of stomatal opening.

(e) Many candidates answered this part in terms of 'limitations' and 'improvements' rather than on 'additional evidence'. Unfortunately, relevant answers lacked clarity. For example, many candidates referred to 'different leaves' whereas examiners were looking for something more specific, relating to type or even species.

Question 2

(a) Maximum marks for this section were not uncommon this year. The mark scheme allowed for a variety of ways for the determination of the disappearance of protein, though most chose the Biuret route. Many candidates used a specified protein to study the enzyme effects, though a sizeable minority used contact lenses themselves. Variable control was generally sound, and specific names and quantities of materials used were clearly stated. It was pleasing to see the attempts by candidates to secure equivalent protein quantities on contact lenses. However, relatively few candidates dissolved the enzymes, which were supplied as a powder.

(b) Two, or even maximum, marks were not uncommon in this section. Tables generally reflected the procedures used in planning and most graphs were correct. Nevertheless they sometimes lacked precision or clarity either in their labels, or type. Descriptions of the graphical format rarely score two marks.

(c) This was the most discriminating part of question 2. Many candidates scored zero or only one mark, with scores of four marks or more being very rare. The most common answer focused on end point difficulties, but this could only be awarded if the planned method would produce such problems. Marks for limitations are never awarded for references to omissions in planning.
Answers on further work lacked precision. There was also evidence of the use of past mark schemes here, which gained little credit. Answers must be specific to an investigation, otherwise they are not credit worthy.

6103/03 Unit 3 Paper 03 Examiners' Report

Maximum mark 38

Mean mark 18.9

Standard deviation 6.3

General comments
The examiners were pleased to see that the majority of the candidates were able to attempt all sections of this paper. It was evident that many candidates had a sound knowledge of the specification requirements and were able to apply this knowledge to the information in the questions. Candidates who did not read all of the information in the questions or who did not take into account the mark allocations tended to produce answers that fell short of the required marking criteria.

Question 1
In part (a), most candidates gave acceptable responses. Common errors included putting decomposition in boxes B and C and reversing photosynthesis and respiration in boxes C and D.

In part (b), relatively few candidates were able to give a satisfactory explanation of the term. Most candidates could name an example. The most common misunderstanding was that the carbon compounds formed by photosynthesis e.g. glucose, starch, make up the carbon sink. Some candidates confused the term with "source and sink" in translocation.

In part (c), many candidates confused the forms of radiation. Common errors included reference to light being trapped, UV turning to infra red, carbon dioxide becoming part of the ozone layer and the sun being absorbed by the gases. Better candidates did give accurate and detailed explanations that often would have qualified for all of the mark points.

In part (d), most candidates could name two acceptable gases. A significant number named sulphur dioxide or referred vaguely to nitrogen oxides.

Question 2
In part (a), most candidates gave acceptable responses. However, some candidates gave contradictory answers e.g. herbivores as secondary consumers.

In part (b), most candidates were able to calculate the percentage correctly although there were many candidates who struggled with basic arithmetic. Some candidates who gave the correct answer did not show a calculation that would have given this answer. Some performed the calculation correctly and then gave incorrect units for the answer.

In part (c), only the better candidates gave answers that involved the relative position of cattle and maize in the food chain that has humans as the final consumer. Many answers included references to maize using less energy than a cow because it does not move around or urinate. A large number of candidates attempted to explain that the cattle would eat the maize and that this is why there would be less available to humans.

In part (d), many candidates were able to make sufficient comment about each of the labelled structures to gain full credit. A significant number of candidates included irrelevant descriptions involving the diastema and the tongue. Overall this section was well-answered.

In part (e), only a few candidates could give answers that explained ways in which more energy can be obtained from plant material by a ruminant such as a cow. Although many candidates referred to regurgitation only the better candidates explained that this enables more digestion or chewing to take place. References to the presence of microoorganisms were common but only a few candidates could give details of their action upon cellulose. Some candidates gave answers that were extensions of their answers to part (d).

Question 3

In part (a), the majority of candidates made reference to the fact that there was no change in Papua New Guinea. Although most candidates recognised that both Thailand and Brunei showed decreases, a large number of candidates wrote two separate descriptions and did not make any comparisons. Many candidates quoted figures without making any comparative manipulation. Some candidates included Malaysia and Indonesia in their answers.

In part (b), most candidates could give two acceptable responses. The most common error was to give reasons that included the use of timber as building material.

In part (c), most candidates were able to make an acceptable comment about the loss of protective cover for the soil or the fact that the tree roots are involved in holding the soil together. Many candidates were unable to gain further credit by explaining that soil would be washed away by rain or that the wind would blow soil away, instead candidates stated that the rain or wind would *erode* the soil. Some candidates concentrated upon the loss of nutrients instead of the soil.

In part (d), there were some very confused accounts. Although many candidates referred to less transpiration relatively few explained that this would cause lower humidity and less rainfall. References to an increased risk of flooding were common although this was not always linked to the increased run-off into lakes and rivers. There were relatively few references to the possible effects upon global climate. Some candidates continued to describe the soil erosion effects.

In part (e), a significant number of candidates did not concentrate upon the changes in the habitat but described the changes in the apes and monkeys in the habitat, although some candidates realised this and renumbered their answers. Candidates who concentrated upon the habitat tended to score high marks. It is emphasised that at this level loss of homes is not considered equivalent to loss of habitat. Most candidates concentrated upon the loss of habitat and the effects upon the food chain. However, many of these answers did not refer to the loss of habitat for those species that relied upon the timber trees. Only better candidates made points concerning the advantages that other species may gain as a result of the removal of the timber trees.

In part (f)(i), most candidates were able to state that there was a decrease in all three of the species as a result of the logging and described some of the changes after this. However, the wording in the question indicates that it was expected that the changes would be related to the time scale to be given credit. Vague descriptions of falls and rises without any reference to the data penalised large numbers of candidates.

In part (f)(ii), very few candidates were able to give acceptable explanations. Many candidates made no reference to the disturbance that the logging might cause. A few candidates used the information given by the photograph that the gibbon might require closed forest to move through the canopy. A large number of candidates confused the different species of langur.

6104 Unit 4 Core Examiners' Report

	Core information for: Option A	Option B	Option C
Maximum mark.....	40	40	40
Mean mark.....	18.8	19.4	21.1
Standard deviation	6.9	6.8	6.9

Question 1

Part (a) was reasonably well done with the majority of candidates scoring 2 or 3 marks. One of the common errors that candidates made was to simply state that the method of transmission was 'neurone' or 'blood' instead of actually answering the question by explaining that it was 'along a neurone' and 'in the blood'. There were a number of candidates who did not appreciate that duration referred to a period of time and gave the differences as 'fast' and 'slow' or 'immediate' and 'delayed'.

In part (b) there were quite a number of candidates who did not identify that chemicals were actually involved in both forms of communication.

Question 2

'Glucagon' was frequently named as the hormone secreted in anticipation of exercise in part (a), presumably because the question had not been read properly or been thought about long enough.

Candidates were not penalised for referring to the wrong hormone in part (b) and many went on to score highly, even though there were some very long-winded ways of simply stating that the glucose was being produced where it was going to be used. There were a surprisingly high number of candidates who thought that readily available glucose would enable the muscle cells to continue respiring aerobically. The terms glucogenolysis and gluconeogenesis were often used wrongly; it would have been better for candidates to simply describe what was happening.

Question 3

Part (a) of this question was very well done with many candidates scoring the maximum 4 marks. The rest of this question was less well answered. A whole range of values were given in parts (b) and (c) (i) for the number of ATP molecules produced, which seemed to bear no resemblance to the information given in the diagram. In part (c)(ii) a number of candidates got into the question and then realised what they were being asked. A number of candidates talked about the need for a lot of energy being required to break the high energy bonds present in the lipid.

Question 4

In past examinations candidates have not answered questions about the kidney very well, so it was pleasing to see candidates doing well on this question.

In part (c) a lot of information irrelevant to the question was written by many candidates who did not know that the ADH was already in the blood stream; long accounts of the detection by osmoreceptors of blood solute potential and subsequent production and secretion of ADH were therefore given. These candidates eventually got around to explaining what happened in the kidney and were awarded the marks accordingly.

Part (d) was answered well by those candidates who realized that they were being asked about the detection by osmoreceptors of blood solute potential and subsequent production and secretion of ADH. Candidates who thought that an increase in solute concentration caused either the solute potential or the water potential to increase as well lost marks. Again, candidates who cannot use the terms "solute potential" and "water potential" correctly may be well-advised to describe solute concentration in this type of question. A number of candidates tried to say that the salt injection would either effect ultrafiltration or increase the concentration of salt in the medulla.

Question 5

Most answers to this question were very good, with many candidates scoring highly. However, there were answers that included diagrams that were poorly labelled and so did not yield any marks.

6104/01 Unit 4 Option A Examiners' Report

	Option only	Core + Option
Maximum mark	30	70
Mean mark	13.0	34.3
Standard deviation	5.6	12.0

Question 6
Many candidates are now familiar with the gram staining technique and have a good understanding of the principals behind it. The most common error was made by those candidates who thought that you could wash out or retain 'colour' as opposed to "stain" or "dye".

Question 7
The role of yeast in dough production has not been tested too frequently in the past but it is clear that candidates do understand this part of the biotechnology syllabus. There were still a number of candidates that think starch is broken down into glucose by amylase and that yeast can only respire anaerobically.
Part (c) was probably the least mark yielding section of this question as many candidates failed to comment on both the temperature and time component of proving the dough.

Question 8
This question was novel in its approach to testing candidates on the growth of microorganisms in culture, but the candidates responded well with the majority attempting to answer the question and scoring well. A number of candidates clearly appreciated the mode of nutrition of fungi, so in part (a) could go further than simply stating that the mould had to acclimatize to its new environment by explaining that it took time to secrete the enzymes, absorb the nutrients and then assimilate them. Few appreciated that using a mycelial plug to sub culture a mould would damage the hyphae.
The calculation caused a few problems for those candidates who did not realize that rate needs to be expressed as per unit time, but they could still score 2 out of the 3 marks. On the whole candidates were stating the correct units too.

Question 9
The parts of this question which tested the structure and classification of the viruses scored well.
Part (b) was not well answered with lots of confusion between the cell infection cycle and latency. A number of accounts suggested that the phage DNA was incorporated into the bacterial DNA and, in some, that this took place in the nucleus. A high number of candidates in part (i) described the events that take place in the lag phase and then went on to give the correct answer to part (i) in part (ii). Very few candidates appreciated the extremely high numbers of particles which get formed in any one cell at any one time and that their release is synchronized.
In part (d) many candidates' answers were written either in terms of the lag, exponential and stationary phase or the growth of viruses, both of which are inappropriate in this context.

6104/02 Unit 4 Option B Examiners' Report

	Option only	Core + Option
Maximum mark	30	70
Mean mark	14.2	35.4
Standard deviation	4.7	10.4

General comments
Questions 6, 8(a)(i) and (ii) were high scoring. Question 8(b) was answered better than previous questions relating to practical work. Questions 7(a) and (c), 9(a)(ii) and 9(b) proved callenging for candidates.

Question 6
The majority of candidates gained three or four marks. More would have gained full marks if they had described the effect of a deficiency rather than just named a deficiency disease.

Question 7
In part (a) candidates often referred to inhibition of respiration, reduction of ethene production and slowing of the ripening process but only a few could gain all four marks available. Most candidates understood the reason for addition of antioxidants in part (b) but in part (c) answers usually lacked detail, with candidates referring to a high temperature rather than quoting a suitable value. Although many answers stated that all microorganisms are killed just as many answers gave the impression that they were describing pasteurisation.

Question 8
Most candidates gained all of the marks available in part (a)(i) and (ii) for dealing with the data but dropped a mark in section (iii). Answers here tended to be restricted to references to excess carbohydrate in the diet and a lack of exercise. Few candidates made the important link between the intake of energy being greater than the usage of energy.
There were some good descriptions of the use of a calorimeter in part (b) with many candidates scoring at least three of the four marks available. Weaker candidates often did not refer to the mass of the fat sample or the volume of water. Temperature change of the water was the point awarded most commonly. A few answers were completely irrelevant describing the use of skinfold calipers.

Question 9
Many candidates gave very limited answers in part (a)(i) and only described that there was a decrease in mortality as dietary fibre intake increases. Answers in which there was a failure to manipulate data accurately or at all were common.
In part (a)(ii) there was much confusion between increased and decreased transit time. Also many referred to digested food rather than faeces. Most answers that gained credit did not go beyond a reference to a decrease in transit time of faeces in the gut.
In part (b) many candidates seemed unaware that this question was no longer asking about cancer of the colon and almost repeated their answer to part (a)(ii). Very few candidates could give any details about diverticular disease at all. Most candidates gaining a mark here did so for referring to a low level of dietary fibre. A significant number of candidates described coronary heart disease.

6104/03 Unit 4 Option C Examiners' Report

	Option only	Core + Option
Maximum mark	30	70
Mean mark	15.5	37.9
Standard deviation	5.2	10.8

General comments
Candidates performed well on this Option. All sections produced some very clear responses indicating a firm grasp of the physiological principles involved. However many candidates wrote lengthy answers to direct questions which meant that they often contradicted themselves and therefore gained no marks. It was also clear that some candidates did not read the information provided carefully or thoroughly and as a result wrote a lot of irrelevant information that was not pertinent to the question.

Question 6
This was a straightforward recall question based upon the practicals listed in the specification. Many candidates failed to recognise the features of myofibrils from an electronmicrograph. The commonest answer to part (a) was 4 instead of 10. The calculation posed few problems. The demonstration of the action of ATP was well known by many candidates but a significant number of candidates seemed to have no idea how this might be carried out. References to measuring muscles after exercise and injecting ATP into frog's legs were seen several times. Some candidates had missed the information in the first line asking for a description of a practical procedure and described the mechanism for muscle contraction.

Question 7
This was answered well by the majority of candidates. Part (b) aimed to test a candidate's knowledge of how the immune system is able to prevent the development of a disease by using antibodies and/or macrophages keeping bacterial numbers too low to cause clinical symptoms. In part (c) it was clear that candidates appreciated the need for prolonged treatment. It was pleasing to see how many candidates were able to name the specific drugs used.

Question 8
There were some excellent answers to this question. Some candidates gave very clear and concise answers whereas others provided large amounts of irrelevant material. A number of candidates referred to ventilation in their opening statements and then proceeded to explain the increase in cardiac output. A large number of candidates incorrectly cited the need for oxygen as the driving force for increased ventilation rather than the build up carbon dioxide in the blood. Many candidates contradicted themselves by stating that increased acidity increased the pH of plasma. At A2 it is expected that candidates would refer to specific effectors such as the diaphragm and intercostals muscles.
Part (b) asked for a description of a very simple graph and many candidates gained all three marks by using adjectives to describe the changes and qualifying their answers using the time to pin point them. Part (c) was answered well.

Question 9

There were a high percentage of correct answers to parts (a) and (b)(i) although the spellings of Bainbridge were varied; 'Brainbridge' being the most frequently seen.

In part (b)(i) candidates made good use of the diagram provided and most gained three marks. The first mark point was for recognising that an increase in blood volume would lead to an increase in blood pressure. This mark point was not awarded as often as expected.

Part (c) was asking about a specific type of pacemaker used to treat heart block but many candidates gave full and detailed accounts of the different types. They did gain the mark points available but possibly wasted time including irrelevant details. The most common error was to suggest that the artificial pacemaker was wired directly to the SAN rather than to the cardiac muscle.

6105 Unit 5B Examiners' Report

Maximum mark 70

Mean mark 38.6

Standard deviation 11.0

General comments

This paper proved to be accessible to candidates of all abilities. As in previous years, there were a number of sections worth 4, 5 and 6 marks to allow candidates to write more detailed answers to questions. However it is important for the candidate to stick to the question and write concisely. No credit is gained if candidates repeat the question. There was a poor quality of writing this year and a number of scripts were almost illegible. Since the scripts are scanned and marked online it is particularly important that candidates write neatly in blue or black ink.

Question 1

Part (a) was well answered and candidates showed a good understanding of why DNA was heated. Some candidates referred to H bonds breaking but failed to mention bases or nucleotides. In part (b), there seemed to be a great deal of misconception about the structure of primer which was frequently referred to as DNA. The better candidates were able to mention the short length of nucleotides, but few mentioned that primers were single stranded. Most candidates were able to refer to complementary bases or nucleotides, but few mentioned that the primer started the polymerase reaction. In part (c) most candidates were able to suggest length of time.

Question 2

Part (a) was answered well, although a number of candidates wrote at length about isolation and speciation rather than focussing on the meaning of the term 'species'. A surprising number of candidates were unable to identify a procedure and simply repeated the phrase 'DNA analysis' from the question. Part (c) proved to be a good discriminator. The first three marking points were easy to obtain. However, marking points 6 8 and 9 were only mentioned by the higher ability candidates.

Question 3

This was a high scoring question with many candidates gaining full marks. Weaker candidates muddled NADP with NAD and were unable to explain the role of RuBP. In part (d)(ii), a number of candidates failed to gain credit because they failed to link their explanations to their answer to part (i).

Question 4

In part (b) most candidates referred to the immediate food chain and did not think laterally into other parts of the food web. In part (c) marks were sparse. Many candidates referred to fertilisers and pesticides as if they had the same effects. However, there were some good accounts of bioaccumulation. Answers tended to be repetitive and candidates wrote a lot but made very few pertinent points. As a consequence, candidates tended to gain credit for comments on food availability and habitat loss and little else.

Question 5

In part (a) there were some excellent, concise answers. However, a number of candidates went further than the cellulose molecule and described cellulose (the substance) and cell walls. Some weaker candidates referred to polypeptides and beta pleated sheets. In part (b), many candidates gave separate descriptions rather than a comparison. Part (c) was very well answered with some excellent accounts covering all 8 marking points. However part (d) was not well answered with only a few candidates mentioning the rumen or the source of the cellulose. Others incorrectly described cellulose as being broken down to fatty acids.

Question 6

Part (a) was very easy to answer for some candidates and difficult others. Part (b) proved to be a discriminating question. There was a lot of confusion between "bases" and "amino acids" with the two terms often being used interchangeably. Most candidates were able to pick up one point for referring to deletion, addition or substitution. However many candidates described amino acids as coding for a protein or a change in a codon causing a different amino acid to be produced. Answers to part (c) varied in standard. Many candidates did not answer the question, which was concerned with the role of a transmitter and instead provided a standard answer on the workings of a synapse. As in previous years, there was some confusion between pre- and post-synaptic membranes. Some candidates continue to use terms such as a "message" or "signal" which are not appropriate for A2.

Question 7

In part (a), a number of candidates described transpiration as the movement of water from roots to leaf rather than the loss of water vapour from the aerial parts of a plant. Part (b) was poorly answered with candidates not making good use of the information provided. In part (b)(ii), the most common points seen were the decrease in transpiration over the three days, reduced uptake by the roots and stomata closing. However, the general understanding of this process was poor. Most candidates gained full marks for part (d).

6115 Unit 5H Examiners' Report

Maximum mark 70

Mean mark 33.7

Standard deviation 10.6

General comments
This paper shared common questions 1, 2, 4, 5 and 6 with 6105/01. The performance on this paper was extremely variable on all questions. There was no evidence that candidates were not able to complete the questions in the time allocated.

Question 1 and 2
Common with 6105

Question 3
In part (a), most candidates were able to gain some credit for their description of an allele. Only the better candidates explained that the different alleles for a gene could occupy the same locus. Many candidates included irrelevant detail concerning the phenomenon of dominant and recessive alleles. Some candidates described alleles as being letters of the alphabet.

In part (b), most candidates could name a technique. The descriptions of the method were less accurate. Most candidates described the sampling of amniotic fluid. Some of the errors included needles or other instruments being inserted into the fetus itself, inserting needles into the stomach or removing samples from the vagina. Some detailed and accurate descriptions were seen.

In part (c)(i), most candidates were able to give the correct probability. It is to be noted that, at this level, a ratio is not considered to be the same as a probability. It was also evident that many candidates were able to use the information in the question to back up their suggestion. A large number of candidates suggested that as the couple had already had a child with MSUD their chance of having another was reduced.
In part (c)(ii), many candidates were able to deduce that at least one of the two parents must be a carrier. Only the better candidates were able to follow this by using some evidence correctly.

Question 4 to 6
Common with 6105

Question 7
In part (a), only a few candidates could give answers that showed very much progress beyond GCSE. It was expected that detailed explanation would be given as to how the structures facilitate gas exchange. It was common to see the description of a structure being followed by answers similar to "to make diffusion easier". The thin wall was the most common structural feature given with relatively few extra details such as the single layer of cells or the squamous epithelium being included. Many candidates use the term "membrane" as synonymous with "wall". Some candidates referred vaguely to blood vessels rather than capillaries. There were some very good descriptions of the role of the surfactant in lowering surface tension or prevention of alveolar collapse. Many candidates still mistakenly believe that the rate of diffusion of respiratory gases is faster in solution than it is in the gaseous phase.

In part (b)(i), only a few candidates could explain that oxygen is being removed from the alveolar air. Some candidates made reference to the expired air being a mixture of air from the alveolus and the inspired air. In part (b)(ii), many candidates repeated the information that the diffusion gradients would be maintained but only the better candidates could explain how this was brought about.

In part (c), there were some very good answers with good descriptions of the effect of carbon monoxide and nicotine. Many candidates stated that harmful substances could pass across the placenta but details concerning their effects were usually not given. Most candidates scored some credit by reference to low birth weight or increased risk of miscarriage. A number of candidates suggested that the fetus would inhale the smoke. Some candidates stated that the mother's blood would carry substances into the fetus.

In part (d), most candidates gained credit by referring to one or more of the diseases that are associated with smoking. Many candidates were then able to gain further credit with a reference to one of the appropriate effects upon a particular age group.

6106/01 Unit 6 T2 Individual Study Examiners' Report

Maximum mark 32

Mean mark 18.7

Standard deviation 5.0

General comments
Once again there were many individual investigations which demonstrated excellent planning skills and interesting, original scientific studies. However, a small number of centres appeared to interpret 'individual' as merely the idea that candidates have written their plans under supervision regardless of the fact that a highly directed approach has resulted in almost identical outcomes which do not provide acceptable evidence of each candidates' ability to meet the criteria.

Centres are also strongly recommended to advise candidates not to submit investigations such as enzyme experiments which are very similar to common approaches at AS or even GCSE level. Where they choose to do so, it is expected that they will display clear evidence of progression in depth of thought and understanding in all criteria if they are to be awarded more than minimal marks. A thorough understanding of rates, precisely what rate is being measured by the techniques adopted and how this may be accurately tested statistically would be a basic minimum at A2 level.

Planning
Where ecological studies are planned it would be have been helpful to many candidates to ensure that their hypothesis was more specific, either by considering individual species, or by resisting the temptation to include more than one variable. There were many more candidates who used a careful choice of site to mitigate the effects of several variables in such investigations, but this was not always clear. The main causes of significant differences between examiners and centre assessments in this section were a lack of evidence of individual planning and a failure to consider all important variables. A clear, well-defined hypothesis with a carefully justified statistical test is often the defining feature of a successful, high-scoring investigation.

Implementing
It is essential that there is some annotation on the scripts themselves to indicate why centres have awarded marks for I(a) and I(b).

Only minimal marks can be supported for highly inaccurate methodology such as bubble counts, height of froth or dough, even though, regrettably, they appear to be accepted in some cases. To support centre marks for this section examiners check evidence for I(c) in tabulation of raw data. Where marks cannot be supported it is often because of elementary errors in formatting and labelling of tables.

Introduction
Many candidates still lack the selectivity expected at A2 level in the copious amounts of theoretical background they quote. This is also an ideal section to provide accurate referencing in context to meet the criteria for Style 3(b).

Method
A surprising number of candidates gave method accounts which simply could not be replicated. A particular problem arises in ecological studies where exact locations are not identified. It is not expected that candidates will simply duplicate their planned method in this section. Where one clear account has been given this is sufficient, but examiners are looking for detailed amendments and further developments in the light of conclusions from pilot experiments or preliminary work.

Analysing
For high marks in A(a) summary tables are expected to be accurate and clearly formatted including consistent and sensible significant figures.

Careful selection of the relevant graphical format still provides problems for many candidates. Quantity of graphs often takes precedence over relevance to the hypothesis and many candidates do not attempt to include error bars. There appeared to be an increased trend to producing lines of 'best fit' which were often not justified by the data. This was sometimes compounded by selecting such lines and then claiming variability was low because most points were close to these lines despite the fact that they had been deliberately chosen to be so.

Many candidates find the line between describing important trends and patterns and simply repeating the data they have tabulated difficult to judge. Where there are clearly no anomalies it is acceptable to simply state this rather than attempt to label the smallest variation as anomalous or remove data because it does not conveniently fit the predicted pattern.

Whilst examiners accept a wide range of relevant statistical tests, this should normally be a single calculation and interpretation using a 5% confidence level. Where computer programmes are used for processing it is essential that these are identified and that the interpretation of the final test statistic is clearly described in the candidate's own words. Where multiple tests are submitted, they are almost always a reflection of poor planning and candidates can rarely make meaningful conclusions from them.

Discussion and Evaluation
This remains the weakest section for many candidates. Too often biological knowledge and understanding are simply regurgitated from the introduction without clear reference to the actual data collected.

There still appears to be a widespread misunderstanding of the requirements for D(b). Only a few candidates appeared to follow the pattern of thought encouraged by several linked criteria. Whilst it is appreciated that clear objective reflection of the investigation is a difficult skill, many candidates would have scored more highly had they made links between the different criteria. Those who drew error bars on their graphs in A(a) and identified real anomalies often continued to discuss the variability in their data in some way. Only a small minority of candidates were able to continue along this line to actually use their comments to assess reliability for D(b)6+.

The final stage in this logical progression is to consider the question 'No matter how carefully this investigation was carried out, what could still be causing variations in my repeat readings?' Those who followed this reasoning were able to suggest sensible ideas for further work but many ignored the key phrase in the criteria '*which would provide considerable additional evidence for the conclusions'* and suggested launching completely new investigations which were not related to the original hypothesis and therefore could not gain significant credit.

Style

Many more candidates now include an abstract which is concise but do not always include all the elements suggested in the criteria. Many investigations were well presented and demonstrated good scientific literacy. Referencing was very varied. Internet sources are acceptable but candidates need to ensure that full details are given and that they consider the reliability of the sources they quote.

6106/02 Unit 6 W2 Written Alternative Examiners' Report

Maximum mark 38

Mean mark 18.3

Standard deviation 5.0

General comments

There was a marked distinction between candidates who sought to apply their understanding of scientific investigations to the actual questions and those who were simply seeking to apply previous mark schemes. Those who relied heavily on this latter approach often gained few marks in several sections. It is important to stress that points on the mark scheme are only awarded in the correct context. This was especially true for statistical analysis in question 1 and suggestions for tabulation and graphical analysis in question 2 part (b). First-hand experience of planning and carrying out a range of practical work is clearly the best preparation for this paper in addition to being an integral part of the Advanced Level course.

Question1

Knowledge of medians is a clearly stated requirement of the specification and many candidates answered this question well. Whilst the Mann-Whitney U test is not a specific requirement, full details were given in the rubric and candidates were only expected to apply their knowledge of interpreting statistical tests.

(a) Most candidates were able to rank the data in a suitable table and hence could gain most marks without knowledge of medians.

(b) A variety of appropriate graphical formats was accepted but it was disappointing to see a substantial minority of candidates using sample number as an x axis and attempting to pair what were random samples.

(c) The examiners were looking for precision in stating the null hypothesis, especially a 'significant' difference between the medians.

(d) Many candidates gained two marks for interpreting the test result correctly but it was expected that candidates would demonstrate their understanding of a 5% significance level rather than simply quote p=0.05 from the table without explanation.

Question 2

(a) There was a wide range of approaches to this question, many of which covered a large number of marking points. Attempts to standardise plots of land and the beetles were common but precise details of practical methods of assessing the results were more limited.

It is recommended that plans are written in continuous prose to meet the criteria for 2 marks. Numbered or bulleted points can be accepted but many are list-like and ungrammatical. Only very limited credit can be given where sequencing is poor or afterthoughts are 'added on' to the main account.

(b) Tabulation of data was very variable. Many candidates omitted columns for the type of raw data they had suggested in their plans and some were determined to calculate means from inappropriate data. Similarly many candidates named statistical tests regardless of what had been measured. Suggestions of t-tests on measurements taken over time were common without further explanation of precisely what was to be tested.

(c) Overall this was the weakest area for many candidates. Suggestions for correcting obvious errors in planning are not considered as limitations. It was evident that some candidates were simply attempting to recall lists from previous mark schemes without applying them carefully to their planned method.

All sections of this paper are closely linked to the coursework criteria and hence suggestions for further work are expected to provide additional evidence to support the conclusions concerning the hypothesis under test. Suggestions which involve launching completely new hypotheses therefore do not gain credit.

6106/03 Unit 6 Synoptic Examiners' Report

Maximum mark 38

Mean mark 18.5

Standard deviation 5.6

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.

Success in synoptic questions, therefore, requires a sound knowledge and understanding of the specification content, and an ability to apply this in new contexts. One particular area of weakness noted on this, and previous synoptic papers, has been a generally rather poor recall of factual information from the AS units. This was evident in question 3, for example, where there were numerous errors in both the structure and digestion of carbohydrates. It is also important that candidates read the questions carefully before attempting to answer them. There were a number of instances where the answers were irrelevant, or contradicted information included in the question.

In general, questions 1 (a)(i) and 2 (c) were answered correctly by the majority of candidates and there were also some good answers to question 3. Questions 1 (b)(ii) and 2 (d) were less well answered, answers to other parts of both questions were very variable. The standard of written English in the essays, in particular, continues to be a source of concern to the examiners. Some of the essays were, however, carefully planned and coherently written and were, consequently, a pleasure to read.

Question 1

The great majority of candidates answered part (a)(i) correctly. In part (a)(ii), whilst many candidates were able to suggest advantages of budding, there were a number of answers giving advantages of meiosis, in terms of increased genetic diversity. The most frequent advantage given was that it enables rapid population growth; many references were also seen to the fact that the daughter cells are genetically identical to the parent cells and are therefore adapted to the prevailing conditions. In part (a)(iii), many candidates used their knowledge of the cell surface membrane and correctly referred to membrane glycoproteins acting as receptors and commented on the complementary nature of the small proteins and their receptors. However, there were also many irrelevant answers, giving general descriptions of membrane structure, including references to permeability, without addressing the question.

Many candidates answered part (b)(i) correctly, but there were also various incorrect suggestions, including structures that are not part of a mitochondrion. In part (b)(ii), there were many detailed accounts of the function of the electron transport chain (in some cases filling the entire page) and including a restatement of the information given in the question. However, these answers did not always explain why the petite cells grow slowly compared with normal yeast cells. The majority of candidates correctly suggested that these mutant cells may produce less ATP than normal cells, but this was rarely qualified other than with a vague statement about ATP being 'needed for growth'. A number of candidates, however, stated that ATP is required for processes such as protein synthesis and were, accordingly, given credit.

Answers to part (c) were very variable. Although many candidates sensibly interpreted the data and concluded that the cause of the petite phenotype is a mutation in the mitochondrial DNA, there were also a number of vague and incorrect suggestions. Some candidates ignored the information included in both parts (b) and (c) and concluded that the petite phenotype is due to, for example, environmental conditions.

Question 2

Part (a) of this question required candidates to apply their knowledge of immobilised enzymes and factors affecting enzyme activity to this investigation. There were some good, concise answers including references to the bacteria remaining on the discs so that the emission of light is easier to see, and references to the effects of changes in temperature on enzyme activity and on metabolism. There were, however, some very vague answers including only references to controlling variables and 'making it a fair test'.

In part (b), many candidates gave an overall description of the relationship between the concentration of mercury chloride and the duration of light emission and supported this with an appropriate reference to the data. There were also a number of answers giving either the trend, or a reference to the data, but not both. Part (c) was answered successfully by most candidates, who correctly identified mercury and supported their answer by comparing the effect of mercury with the other metals.

Answers to part (d) were very variable. Whilst a number of candidates suggested an appropriate method, with experimental details, many did not. A number of candidates suggested totally different approaches, including toxicity testing with other organisms. Marks were often gained for references to the use of a control and for indicating that pollution with heavy meals would be expected to decrease the duration of light emission.

Question 3

This was by far the most popular choice of essay, but the standard was very variable. Some essays contained practically no relevant, or correct, information, whilst others gave good, detailed accounts of all three aspects of this question. Many candidates did not attempt to explain what carbohydrates are; those who did often stated only that they consist of carbon, hydrogen and oxygen. Indeed it was clear from many accounts that a number of candidates were under the impression that the word carbohydrate is synonymous with starch. Digestion was frequently described inaccurately and, although salivary amylase was usually included, the sources and effects of other carbohydrases were generally inaccurate. Some accounts included irrelevant information on the digestion of proteins and triglycerides. Explanations of the uptake of monosaccharides were often brief, sometimes with only a passing reference to the diffusion of glucose into capillaries. A number of candidates used the term 'reabsorption' of glucose in the ileum, and then digressed into descriptions of kidney function.

Descriptions of digestion and absorption were usually followed by an abrupt change to accounts of the regulation of blood glucose. Candidates rarely made coherent links between the absorption of glucose, consequent changes in blood glucose, detection and regulation. Perhaps inevitably, there was much confusion between glycogen and glucagon, and the sources of both insulin and glucagon were often cited incorrectly. It was also notable how many candidates incorrectly described detection of changes in blood glucose concentration by the hypothalamus and the apparent involvement of the pituitary gland. Numerous essays gave the impression that insulin is secreted only when the concentration of glucose in the blood is high, rather than a more accurate indication that the rate of secretion of insulin increases as the blood glucose concentration increases.

However, there were also some good, accurate accounts including details of carbohydrate digestion (sometimes with references to both ruminants and saprobionts), absorption and regulation, with good descriptions of the roles of insulin, glucagon and adrenaline.

Question 4B

The general standard of this essay was rather poor, with few details of the uptake, transport and roles of mineral ions. Many candidates who attempted this essay gave general descriptions of the movement of water across the cortex of a root and there were also some quite good accounts of the uptake of ions by diffusion and active uptake. However, many candidates then incorrectly described the movement of water and mineral ions upwards in the phloem, and included irrelevant details of phloem structure and function. Some essays included little or no information from Unit 5B on mineral nutrition in flowering plants; indeed some contained no named examples of mineral ions at all.

Question 5H

This essay required integration of knowledge and understanding of topics from Units 2H and 5H. A small minority of candidates attempted this essay and, as with Question 4B, the general standard was poor. Some essays included lengthy, and irrelevant, accounts of human evolution, without including any details of primate features and diversity. There were few accurate accounts of adaptations to high altitude; some of the answers were rather superficial, referring only to the consequences of low partial pressure of oxygen and not including other environmental conditions at high altitude. There is a tendency for candidates to refer vaguely to 'thin air' or 'less oxygen' at high altitudes, when a more precise reference to the partial pressure of oxygen is expected.

Very occasionally, an essay included details of primate features and diversity, and the physiological and structural adaptations of humans to life at high altitudes.

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 Summer 2005 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	42	38	34	30	27
6112 Unit 2H	60	42	37	32	28	24
6103 Unit 3	70	50	44	38	32	27
Paper 01 T1	*32*	*26*	*22*	*18*	*15*	*12*
Paper 03	*38*	*24*	*21*	*19*	*17*	*15*
6103 Unit 3 (International option)	70	46	41	36	31	26
Paper 02 W1 International only	*32*	*22*	*19*	*16*	*13*	*11*
Paper 03	*32*	*24*	*21*	*19*	*17*	*15*
6104 Unit 4 Option A	70	48	43	38	33	28
6104 Unit 4 Option B	70	47	42	38	34	30
6104 Unit 4 Option C	70	50	45	41	37	33
6105 Unit 5B	70	50	45	41	37	33
6115 Unit 5H	70	50	45	41	37	33
6106 Unit 6 (Option 1)	70	49	44	39	34	29
Paper 01 T2	*32*	*24*	*21*	*18*	*15*	*12*
Paper 03	*38*	*25*	*23*	*21*	*19*	*17*
6106 Unit 6 (Option 2)	70	48	43	38	33	28
Paper 02 W2	*32*	*23*	*20*	*17*	*14*	*11*
Paper 03	*38*	*25*	*23*	*21*	*19*	*17*

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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