edexcel
advancing learning, changing lives

# Examiners' Report Summer 2007

GCE

## GCE Biology (8040/8042 / 9040/9042)

Edexcel Limited. Registered in England and Wales No. 4496750
Registered Office: One90 High Holborn, London WC1V 7BH

A PEARSON COMPANY

Edexcel is one of the leading examining and awarding bodies in the UK and throughout the world. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers.

Through a network of UK and overseas offices, Edexcel's centres receive the support they need to help them deliver their education and training programmes to learners.

For further information please call our Customer Services on 0870 240 9800, or visit our website at www.edexcel.org.uk.

June 2007

Publication code UA018980

# Contents



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

# 6101 Unit 1 Examiners' Report

Maximum mark ..... 60

Mean mark ..... 30.7

Standard deviation ..... 11.6

## General comments

Questions 2, 5(b), 5(c)(ii) and 7(a)(ii) were relatively high scoring. Questions 3(b), 4(b), 5 (c)(i), 6(b)(ii) and 7(d) proved to be more difficult.

## Question 1

Many candidates were able to gain three of the four available marks. The greatest uncertainty was in knowing which type of cell contains centrioles.

## Question 2

Very few candidates gained all five marks on this question, principally because the majority of candidates thought that ester bonds link hydrogen, carbon and oxygen together in lipids. Most correctly recalled that three fatty acids joined to glycerol by condensation reactions and gained three marks. Not as many identified that triglycerides with double bonds between carbon atoms are unsaturated.

## Question 3

(a) More candidates could name part B (vesicles) than part A (cisternae).

(b) This question was not answered very well. Although there were references to modification of proteins, formation of glycoproteins and descriptions of proteins packaged in vesicles, it was rare to see all of these ideas put together in one competent answer. A significant number of candidates gave irrelevant details of what occurs after vesicles have budded off from the Golgi apparatus.

## Question 4

This question required candidates to be familiar with practical work prescribed in the specification. It appeared that a considerable number of candidates had not performed a test for a non-reducing sugar.

(a) Although many identified both carbohydrates as reducing sugars, they failed to appreciate that A was more concentrated than B and could not gain the second mark. A considerable number thought that a green precipitate meant a non-reducing sugar was present.

(b) A large number of candidates could not describe the necessary sequence: heat with acid, neutralise and then add Benedict's reagent. Some omitted the first two stages and simply repeated the stem of the question.

**Question 5**

Most could put the phases of mitosis in the correct sequence in (b), but there was much confusion about the events of prophase in (c)(i). Many answers referred to chromosomes becoming shorter because they were uncoiling or unwinding. A number of answers referred to prophase I and prophase II indicating confusion between mitosis and meiosis. Poor expression let some candidates down. For example, references to DNA condensing, rather than chromosomes condensing, are fine, but it is not acceptable to continue that DNA can therefore be seen more clearly. Centromeres and centrioles were confused in (c)(iii) with several references to centrioles moving towards opposite poles. Separation of chromatids was awarded a mark, but many answers referred to separation of chromosomes, which is incorrect.

**Question 6**

In (a), some answers failed to refer to the cell surface membrane at all. Common errors seen by examiners were descriptions of the proteins moving from a high concentration to a low concentration, and statements about the proteins, rather than ATP, providing energy for active transport. Poor expression when describing concentration gradient was common. For example, 'with' or 'along' a concentration gradient are not acceptable alternatives to down a concentration gradient. In general, candidates could give better descriptions of active transport than facilitated diffusion.

The most common reason for loss of marks in (b)(i) was due to inaccurate reading from the graph. Many stated that there was an increase in the concentration of X for the first 2 hours or 2 ½ hours. Neither of these values is precise enough to gain credit. Several answers in (b)(ii) were just repeating the stem of the question with references to lack of ATP formation.

**Question 7**

(a)(i) It was disappointing that so few knew that the pyrimidines are cytosine and uracil. A considerable number of candidates wrote down the names of all four bases.

(b) The calculation was done quite well. The most common reason for losing a mark was because candidates failed to multiply by three, to account for the fact that each amino acid is coded for by a triplet of bases. Some candidates considered that there might also be start and stop codons present. The mark scheme took this into account and ensured that their calculation gained full marks.

(c) The descriptions of translation in ranged from excellent, detailed descriptions written in a logical sequence, to answers that simply described it as the process occurring after mRNA has left the nucleus. A worrying number described transcription rather than translation.

(d) A large number of candidates could not make a valid suggestion here. When a mark was awarded, it was usually for identifying that the DNA would not be enclosed by a nuclear membrane.

**Question 8**

In (a), although many candidates referred to proteases breaking down proteins, relatively few could give any further valid statements.

(b)(i) This question expected candidates to give an answer in a comparative style. Many, however, gave answers that were not written in an appropriate way and left examiners to make the comparisons. The most common statement that gained a mark was for indicating that both enzymes have the same optimum pH. A considerable number of candidates was also able to state that Q was active over a wider range of pH values.

In b(ii), although a significant number correctly identified the two enzymes, few were able to give valid reasons for their choice. Some candidates stated that pH, rather than enzymes, broke down the stains.

(c) Although there were some good answers here, relatively few gained all four marks. It was fairly common to award candidates three marks for knowing that bonds are broken, changing the shape of the enzyme's active site, so that the substrate no longer fits. Sometimes a candidate lost the mark for knowing that bonds are disrupted by pH changes, because they incorrectly referred to the breaking of disulphide bonds.

# 6102 Unit 2B Examiners' Report

Maximum mark ..... 60

Mean mark ..... 38.7

Standard deviation ..... 11.2

## General comments

This was a generally accessible and straightforward paper, which gave candidates opportunities to demonstrate their knowledge and understanding of a wide range of topics from the specification content. High marks were scored in all questions; there were no questions, or parts of questions, which proved to be completely inaccessible to the majority of candidates. In contrast, in June 2006, many candidates found the questions on tissue fluid and oxytocin difficult and these questions were, accordingly, low-scoring.

One perennial difficulty is the inability of some candidates to consider the question carefully and to select relevant information, before attempting their answer. This was particularly evident in questions 2(b), 3(b), 4(b) and 7(a). Many of the answers to these questions contained much irrelevant material, but might, almost incidentally, have included relevant information. The general standard of spelling and organisation of the answers remains as variable as ever. Whilst the examiners do not generally penalise spelling errors, in some cases the spelling of biological terms was so poor as to make the intended answer unclear or ambiguous. The variability of the spelling of 'amylase' is a case in point.

## Question 1

This was a generally high-scoring question and the majority of candidates were able to gain at least three marks. The most frequently correct answers were: salivary glands, glucose, and fructose. However, the source of disaccharidases in the small intestine was not generally well known; many candidates gave 'pancreas' here. The spelling of 'amylase' was often poor. Whilst the examiners are sympathetic towards 'ammalase', for example, 'amylose' is clearly incorrect.

## Question 2

Many candidates were able to name the cells correctly in (a), and many also gained at least one mark in (b) for correctly identifying the nuclear division shown in the graph as meiosis. However, in a number of cases, having identified the process as meiosis, candidates went on at some length to describe this process, rather than address the question specifically. There were many correct references to restoration of the diploid number of chromosomes following fertilisation. Some candidates also correctly commented on the fact that this process results in halving of the number of chromosomes (rather than re-stating the wording of the question) and therefore clearly understood the importance of the reduction from 2n to n during the formation of spermatozoa. It was clear that some candidates failed to appreciate that meiosis consists of two successive divisions as they incorrectly interpreted the graph as showing mitosis followed by meiosis.

**Question 3**

The majority of candidates were able to name the parts correctly in (a) although some candidates carelessly reversed parts A and B. Answers to (b) were frequently overloaded with unnecessary details about the structure and function of the heart, including details of the conducting system and coordination of the heart beat, but often incidentally included the correct sequence of atrial systole, ventricular systole, and complete cardiac diastole. A number of candidates misunderstood the term 'cardiac cycle' and wrote accounts of the double circulation, or coronary circulation. Many candidates gained marks in (c) and appreciated that cardiac muscle is able to contract without a nerve impulse. Some answers, however, suggested confusion between the myogenic property of cardiac muscle and control by the autonomic nervous system.

**Question 4**

In (a), the majority of candidates correctly identified time period A. Part (b) of this question provided another example of candidates giving far more information than is actually required by the wording of the question. Candidates were required to explain how the change in the volume of thorax, during inspiration, is brought about. However, this was often interpreted to mean 'write all you know about the process of ventilation'. These accounts may incidentally have included appropriate details and thus gained good marks. Some of the answers included references to the intercostal muscles, but candidates were expected to refer specifically to contraction of the external intercostal muscles. A number of accounts were rather poorly worded, for example, stating that contraction of the external intercostal muscles 'pushes' the rib cage upwards, or by confusing cause and effect. Part (c) of this question was high-scoring, the majority of candidates correctly suggested factors such as exercise, or an increase in the concentration of carbon dioxide.

**Question 5**

In (a), the majority of candidates were able to identify the anther and stigma, although these were occasionally reversed. In (b), those candidates who correctly gave 'wind pollination', had no difficulty in referring to features of the flower shown in the diagram and generally scored well here. Credit was also given for suggesting 'self pollination', but some candidates hedged their bets and described both wind pollination and insect pollination. Again, some of the answers were rather poorly expressed and showed a lack of some basic biological vocabulary. The majority of candidates scored well in (c), usually for references to protandry and protogyny, but credit was also given for various other mechanisms that ensure cross-pollination.

**Question 6**

Many candidates scored full marks for this question, and showed a good understanding of xeromorphic adaptations. Some of the answers to (b) included detailed descriptions of the adaptations and readily gained full marks. A number of candidates made references to the stomata, although these are not visible in the photograph, but often included other information and were nevertheless able to gain good marks. Some candidates were convinced that this is a hydrophyte and failed to find any features to support their answer.

**Question 7**

This was a discriminating question and a wide range of responses was seen. In (a), there were some good accounts of xylem transport, but many answers included terms such as 'cohesion' and 'adhesion' without any indication of understanding. This is another example of a question which elicited much irrelevance in some of the answers, including details of the passage of water across the cortex of the root. Good answers included references to root pressure, explanations of cohesion and adhesion, transpiration pull and the water potential gradient, readily gaining all three marks.

The answers to (b)(i) were usually satisfactory and many candidates commented on the steady increase in the distance moved by the bubble. Part (b)(ii) was often answered more successfully than (b)(iii). In (b)(ii), many candidates recognised the small increase in the distance moved by the bubble and correctly attributed this to an increase in the rate of transpiration. In (b)(iii), although there were many descriptions of the effect of reducing humidity on the rate of transpiration, the answers less frequently included correct explanations of this effect. Some candidates repeated information given in their answer to (b)(ii), without really addressing the question. There were, however, some good answers which showed clearly that these candidates clearly understood the concept of transpiration and were able to explain the effect of reduced humidity in terms of an increase in the water potential gradient, or an increase in the diffusion gradient for water vapour. Almost all candidates gained the mark in (b)(iv), by stating either temperature or wind speed.

It was disappointing to note that some candidates were clearly confused between the principle of a potometer, and apparatus used to measure the rate of photosynthesis.

**Question 8**

Part (a) was usually answered more successfully than (b). In (a), the majority of candidates referred to the shape of the cells in relation to their surface area, and to the presence of haemoglobin and the transport of oxygen. Other features included references to the lack of a nucleus, or other organelles, and the flexibility of the cells. For the majority of candidates, part (a) of this question presented few problems.

Part (b) was, however, more discriminating and a wide range of answers was seen, but the majority of candidates gained at least one mark for this part. Possibly the most frequent mark point was a reference to the attachment of carbon dioxide to haemoglobin, although the product was often named incorrectly as 'carboxyhaemoglobin'. Some answers also included details of the transport of oxygen, before turning to the transport of carbon dioxide. There were a number of excellent, detailed answers, including descriptions of the formation of carbonic acid and its subsequent dissociation, the role of carbonic anhydrase, and the role of haemoglobin as a buffer. These answers demonstrated a good understanding of this topic and readily gained a maximum of five marks.

# 6112 Unit 2H Examiners' Report

Maximum mark ..... 60

Mean mark ..... 31.5

Standard deviation ..... 10.0

**General comments**

Questions 1, 2, 3, 4 and 8 on this Paper were common between 6102 and 6112. There was no difference noted between the standard of the answers to these questions compared with 6102

**Questions 1 to 4**

Common with 6102

**Question 5**

Generally this question was answered well overall. Candidates unsure of the glands in (a) tended to write prostrate more than once and this usually guaranteed them one mark. In (b), more candidates were able to give the correct function of fructose than of mucus, but the examiners were surprised to see many responses indicating that the function of fructose is to make semen sweet! Part (c) saw many candidates scoring full marks, although it would have been better to have seen more appropriate biological terminology such as 'infertility' rather than 'unable to get partner pregnant' or 'harder to make a baby'.

**Question 6**

Part (a) was not answered well. Few candidates described the changes as 'physiological', some did give examples, but many were inappropriate such as the wearing of additional clothes and hats. Even fewer made reference to the fact that the changes take time, most commented that the changes were short lived and 'things went back to normal' once individuals moved away. Part (b) was answered better with many candidates scoring four or five marks. Poor descriptions lost some marks, such as making reference to increased capillaries but not stating where. Similarly, candidates would identify increased stroke volume as an adaptation and then explain that this meant more blood could be pumped by the heart, so only gained one mark for their duplicated adaptation without explanation. Also, some failed to read the question and made reference to changes other than to the circulatory system, the most common being barrel-chested.

**Question 7**

The majority of candidates were able to explain how sweat glands help to regulate body temperature. Many worryingly thought sweat glands were under the direct control of the hypothalamus. Few linked the loss in heat energy with the water in sweat and many found it difficult to link the level of sweat production in relation to changes in temperature. In (b), the first part was answered the best with most picking up two marks for describing the relationship and calculating the change in internal heat production as the temperature fell. Candidates were expected to quote full units for any figures quoted. In (ii), many were again able to gain two of the three marks by correctly identifying the relationship and by calculating a difference between the Inuits and the Europeans internal heat productions, units again were required. In the final section many were able to identify that the Inuits showed an increased heat production, but could not go on and expand this as to why this was important. There were also many incorrect adaptations, such as long hair, short, flat faces etc.

**Question 8**

Common with 6102

# 6103/01 Unit 3 T1 Individual Investigation Moderators' Report

Maximum mark ..... 32

Mean mark ..... 20.7

Standard deviation ..... 5.5

## General Comments

Overall the standard of coursework at AS Level improved this year in specific areas, most especially in Evaluating. As well as the usual investigations on enzymes – about optima and the effects of substrate concentration on their activity – some centres encouraged their candidates to try out different enzyme investigations where, for example, they were invited to investigate temperature effects in a variety of ways. Centres demonstrating such an approach often realised marks that carried high rewards, especially in evaluation.

This year, centres' scores more closely matched those of the moderators than in the past. Annotations and marks for sub-sections were generally relevant to the tasks and inserted into the scripts themselves, rather than on separate sheets of paper. Moderators far prefer the former approach, since it is absolutely clear where marks are awarded. Centres that revealed their marks in this way usually produced scores that were consistent with those of moderators. Some centres used intermediate marks for sub-sections. This is not recommended: it is best to stick with scores at a particular level and then make judgements as to whether overall, intermediate marks are justified.

Administration from the centres' point of view was much improved once again this year. Very few required reminding about signatures on Record Cards, or about missed items on the OPTEMS. However, for those centres who did not send the most recent Record Cards, details may be found by logging on to www.edexcel.org.uk and activating *Qualifications*, then scrolling to *Biology, AS GCE Biology, Guides* and finally selecting *Record Sheet*. Very few investigations were put into pocket files, and most were secured using treasury tags: thank you.

There are now just a few centres where investigation marks do not reflect the standard of candidates' work, do not carry annotations and fail to apply the hierarchical marking procedures correctly. There are a few centres, too, who mark so generously, particularly in the Analysing and Evaluating sections, that marks require adjustment. Moderators did see many centres where marks were absolutely spot on and where internal moderation was clearly undertaken. Thank you once more.

Whilst many previous reports outlined aspects that caused differences for candidates between centre and moderator, the Principal Moderator does so again, with additional comments on new features.

## Planning

Most centres train their candidates into providing headings for sub-sections, which assist candidates in their attempts to fulfil criteria to a high level, which is beneficial.

The major weakness in Planning concerned biological knowledge. Candidates need to provide short, appropriate accounts of the biology that underpins hypotheses. If these are at A Level standard, then 6 or even 8 marks may be awarded. A number of reports – and sometimes from very able individuals – provided several hypotheses. Such investigations were too long and generally failed to provide sufficient biology to support any of them at the highest levels.

A few centres provide very limited opportunity for Planning at all. Candidates are likely to lose marks if they all carry out essentially the same investigation (usually using catalase) in the same way. If the only material evidence for difference is the variable investigated, then this does not constitute much individual work at the Planning stage. In addition, in such cases, groups of candidates very often analyse their data in identical ways. This is a very risky strategy.

**Implementing**

Moderators changed very few marks. However, when this occurred, it was for three main reasons:

- absence of I(a) or I(b) marks
- inappropriate accuracy
- insufficient data.

If tables are poor, for whatever reason, moderators may well reduce marks where centres suggest I(a) and (b) of 8. However, where centres do not provide any evidence for these sub-sections, especially where an investigation is very simplistic, data suggest lack of precision and tabulation is poor, then moderators have no choice but to award Planning marks based on evidence placed before them, which is the table.

Principal Moderators emphasise the need for consistency and precision at standardisation and moderators will not award high rewards for inappropriate precision. If instruments used for measurements are not very precise, candidates will not gain high marks by providing data that suggest otherwise.

Moderators need to see evidence of considerable data collection. Where repeats may not be reasonable, as in many ecological studies, moderators will not insist on repeats for high marks, but where there are only a few values of a variable – as is typical in enzyme studies – more than one repeat is expected.

**Analysing**

Fewer multiple graphs were seen this year. However, candidates experienced difficulty when deciding on the most appropriate one. There was a tendency for candidates from certain centres to manipulate the data in identical ways and to present the same graphical format. However, although the format was usually (though not by any means always) correct, graphs frequently failed to show the trends and patterns related to the variable investigated. A typical example was the catalase investigation, where data were collected every 5 seconds for several minutes at various temperatures. All these data were subsequently plotted.

Most difficulties were, however, identified in A(b) and (c). In A(b):

- trends and patterns were often very basic, especially where investigations tended to focus on proof
- descriptions failed to include any manipulation of data

and in A(c):

- biology failed to link with specific data – very often because these data demonstrated what was already known – so that the biology merely repeated that in Planning.

**Evaluating**

As always this was the weakest section. Candidates did, however, increasingly focus on A(a). They attempted to describe variability and reliability. Those who just used the terms only gained a low mark, but when candidates began to use these terms and reflect about the influence of precision and the values of repeats on the conclusions as well, they gained high marks. Whilst such candidates remained a minority, more of them grappled with these ideas this year.

Of increasing concern, is the lack of sensible difficulties linked to specific investigations. When moderators considered the overall impression of this sub-section, they remarked that generic points were often made – very often from the mark scheme of the practical alternative paper. Where, for example, candidates used colour to identify end points or where colour provided only semi-quantitative data, these should have been recognised as the basis for all sorts of difficulties and, certainly in semi-quantitative data – of limitations. Overall this evidence was not forthcoming.

# 6103/02 Unit 3 W1 Written Alternative Examiners' Report

*International Only*

Maximum mark ..... 32

Mean mark ..... 14.7

Standard deviation ..... 5.0

---

**General comments**

A very wide range of marks appeared in this summer's paper. Many candidates achieved high scores in Question 1, though the results in Question 2 were much more mixed. Some candidates were well prepared in terms of the basic ideas concerning experimental design, producing tables and graphs reflecting this design and suggesting limitations and further work relevant to the investigation. A significant minority were not well informed at all and it was not unusual to find very low marks on this question.

**Question 1**

Part (a) was generally answered well, with a clearly designed table and correctly calculated percentages. Frequent errors included incorrect calculations, lack of consistency and the inclusion of the percentage sign in every cell. Part (b) answers often carried at least one error. Examiners allowed two types of graphs. If plots were made of original mass values against percentage change, then a line graph was expected; if on the other hand shell number was plotted against percentage change, then a bar graph should have been presented. There was a great deal of confusion about the correct type of graph, though those who plotted mass against percentage change generally presented a line graph, but the alternatives (where the x axis carried discontinuous values) were often histograms and line graphs.

Parts (c) and (d) did not score highly in many cases. For those who presented data in a bar chart, finding trends was more difficult than those who presented their summarised data in a line graph, though many did so. Almost every candidate described the general trend, but there were some who just quoted every event and therefore received no reward at all. The mark scheme provided 6 possible marks that included, as well as the general trend point, any manipulated value from the data, quoted figures that demonstrated the general trend, as well as more specific descriptions of major points of change. Better candidates achieved 4 marks. Identifying the correct anomaly was problematic for many and a large minority failed to comprehend the meaning of the word. Part (d) often delivered a maximum score. Many candidates targeted points 2, 3 and 4 in the mark scheme.

**Question 2**

As outlined in *General Comments*, this question generated a wide range of scores, because some scripts showed evidence that candidates knew the correct techniques and understood how to present data. Many of them, however, were not well prepared in either area. Nevertheless all points on the mark scheme were seen on scripts. In (a), as always on this paper, candidates were rewarded for detail, so that specific elements, such as the number of light intensities, the length of exposure to, as well as the type, of the light source were all essential details that many missed. For those candidates who put forward sensible possibilities for the above and who knew how to obtain specimens for stomatal counts, marks of 7 to 9 were not uncommon. Even those who did not know the techniques could obtain reasonable scores by providing other details, such as control variables, selection of seedlings and number of repeat measurements. Unfortunately, some candidates were confused about the words intensity and density that appeared in the question, often interchanging them in their answers. Vague terms, such as 'about', 'approximately' and 'amount' appeared often, which meant that candidates could not achieve the point they were attempting to make.

There were 3 marks for (b). This section was quite disappointing and many struggled to achieve either 1 or 2. Sometimes the tables did not match the plan at all. Tables need to reflect descriptions at the Planning stage in every detail. If repeats are suggested, then these must be included, as must units where applicable. Where repeats are not stated in the plan, then including a mean column in the table is not accepted. Candidates were often confused as to the correct type of graph and a small number put the axes the wrong way round.

As in the past, limitations and further work presented many candidates with the most significant challenge on this paper. It was a very rare event to find a candidate who scored 6 marks. Many responses on limitations were not relevant to this investigation and those that were often included corrections to the method. All of the points were seen on the mark scheme, though never more than a couple were suggested by any individual. Candidates were more successful at suggesting further work. The most popular suggestions were 'investigating other species' and 'investigating variation of stomata with age'.

# 6103/03 Unit 3 Paper 03 Examiners' Report

Maximum mark ..... 38

Mean mark ..... 14.6

Standard deviation ..... 5.5

**General Comments**

The responses to this paper were extremely variable. Although some candidates were able to give full and detailed answers to questions on most sections, many candidates did not give sufficient detail to gain full credit on the longer sections. It was noticeable that a significant number of candidates did not read questions carefully and, therefore, gave answers which were irrelevant or did not focus upon the main points. Poor expression also resulted in loss of marks.

**Question 1**

Answers to this question showed that most candidates had some knowledge about *Taenia*. However many answers did not contain details beyond the level of general knowledge.

Most candidates gave acceptable responses in (a). In (b), most candidates could attach some labelling to the hooks and suckers. However, many candidates used brackets or double label-lines which did not distinguish these structures. It was expected that reference would be made to the correct region of the alimentary canal for the site of attachment; vague references to the gut or digestive system were not given credit. Common incorrect responses included reference to the hooks as teeth and the suckers being used to suck in blood or food. Candidates who labelled the body as thin or flat usually related this correctly to the increased surface area for the absorption of food. Understanding of the function of the tegument in resisting the enzyme action of the host was good. A large number of candidates included responses about the ability to produce large number of eggs. This was not considered to be directly linked to the mode of nutrition. Although most candidates showed some knowledge of the nutrition of *Rhizopus* in (c), many answers described this organism without making clear comparisons with *Taenia*. Poor use of terminology resulted in loss of marks. External digestion in *Rhizopus* was given as a difference even though the food of *Taenia* is also digested externally to the organism. Many candidates referred to *Rhizopus* feeding upon a dead 'host' which shows a confused understanding of the term. Reference to saprophyte and parasite, without further explanation, were not given credit. A number of candidates described *Rhizobium*.

**Question 2**

In this question, many candidates did not read the given information carefully or did not pay sufficient attention to command words.

In (a), most candidates were able to suggest 'overgrazing'. However, vague references to grazing or large numbers of animals were not accepted. Many candidates were also able to suggest 'lack of rainfall'. Although some very detailed answers gaining full credit were seen in (b), this question was answered poorly by the majority of candidates. The question asked for both description and explanation. Candidates who repeated the causes without further detail could not be given credit. Many did not appreciate that the area being considered is grassland and gave long descriptions of deforestation.

In (c), a wide variety of techniques was seen. However, only the better candidates were able to give follow-up details for full credit. Candidates should be advised to be mindful of the mark allocation, which gives guidance for the depth of answer required.

**Question 3**

The answers to this question were extremely variable. Where candidates read the stems to questions carefully, good answers were seen. However, lack of attention to relevant detail penalised many candidates.

Most candidates gave an acceptable response in (a). However, long descriptions of the causes without reference to the increased acidity of rain or a correct statement about pH were not given credit. In (b), many candidates gave examples rather than sources of the pollutants. Vague references to power stations or cars without further details about the use of fossil fuels were not detailed enough. Some answers included sources of other pollutant gases, such as methane, that would not contribute to acid rain. Very few candidates were able to give more than one credit-worthy response in (c). The most common suggestion was that the hills would receive more rain. However, many candidates suggested that the hills were closer to the rain or that they would receive the rain first. Many candidates were also able to gain credit for references to the evergreen nature of conifers. It was disappointing that, apart from the loss of leaves, very few candidates could suggest clear and precise symptoms of acid rain in (d). Many candidates gave responses that implied that the acid would corrode the trees directly causing trunks and branches to be dissolved and lose their structure. There were some very detailed answers from better candidates which gained full credit.

In (e), the descriptions of the changes in pH were usually quite reasonable and most candidates made some reference to the relatively sudden change between May and June. Some candidates stated that the change was 'in June'. Candidates who referred to dramatic or drastic changes, without giving some idea of the magnitude or rate of the change, were not given credit. Most candidates gained credit in (f) for referring to the decrease in aluminium ion concentration and the idea of the fluctuations after liming. However, the readings taken from the graph were extremely variable and many candidates could not be give credit. Explanations of the effect of liming upon the aluminium ions in the soil were disappointing. Many candidates suggested that aluminium ions are acidic and that they were neutralised by the alkaline nature of the lime directly. Many candidates did not attempt any explanation. Irrelevant descriptions of the changes before liming were common.

In (g), many candidates described the increased secretion of mucus by the gills and a consequent effect upon gas exchange, and gained full credit. Poor responses included the idea that aluminium ions block the gills, vague references to toxic effects, suggestions that the ions caused eutrophication and references to respiration as equivalent to gas exchange. Although most candidates gave some idea of the increase of the prey of the predatory fish in (h), it is expected that, at this level, food chain terminology is used. Vague references to increases in 'little fish' or 'organisms that the fish eat' were common. Very few candidates gave responses that gained full credit.

# 6104 Unit 4 Core Examiners' Report

| | Core information for: Option A | Option B | Option C |
|---|---|---|---|
| Maximum mark..... | 40 | 40 | 40 |
| Mean mark..... | 23.5 | 21.5 | 23.3 |
| Standard deviation ..... | 7.7 | 7.2 | 7.4 |

**Question1**

This question was answered reasonably well. Common errors included:

- confusion over the reduced/oxidised states of the coenzymes produced during glycolysis and the Krebs cycle,
- naming carbon dioxide as a product of glycolysis,
- not being precise enough about the location of the electron transport chain,
- stating that the electron transport chain occurs on the stalked particles.

**Question 2**

In (a), the majority of candidates could name the target organs of glucagon and FSH correctly; the most frequently seen incorrect answers were naming the pancreas as the target organ for glucagon, and the pituitary gland as the target organ for FSH.

Part (b) was attempted by most candidates, with quite a high number scoring all three marks, usually marking points 1, 3 and 5. Relatively few candidates picked up on the idea of one enzyme working on more than one substrate so marking points 2, 4 and 6 were awarded less frequently. Some responses were too vague with a number of candidates simply stating that **'**binding of glucagon activates an enzyme**'**.

**Question 3**

There were some good descriptions of anabolism and catabolism in (a), although there was the expected confusion between the two terms. Candidates who did this could still score two marks for their examples, provided they were consistent with their definitions. Marks were lost by candidates who failed to give examples of each process or who just wrote the names of processes as examples, such as photosynthesis or respiration.

Candidates scored well in the first two parts of (b). The responses to the third part were more variable, but the majority of candidates did attempt the question. Marks were lost by candidates who just stated that production of fumarate / malate / NADH is *inhibited* (marking points 1, 2 and 8), by candidates who did not write about the effect on the *concentration* of oxaloacetate (marking point 3) and by those who did not state that *more* oxoglutarate is formed (marking point 7).

**Question 4**

For a kidney question this one was done well!

Many candidates scored both marks in (a). The most common error was simply to repeat the stem of the question without actually going on to explain the effect of increasing the diameter of the afferent arteriole and decreasing the diameter of the efferent arteriole.

Part (b) generally scored highly, although poorly worded answers did cost some candidates marks; for example 'excess amino acids are deaminated in the ornithine cycle' was seen on a number of scripts. There is still a tendency for candidates to omit 'excess' in marking point 2.

Some good attempts were made at (c)(ii), with many candidates giving two suggestions for the lower urea concentration on Day 2. Only the more able candidates were able to explain how these reasons affected the urea concentration.

**Question 5**

The majority of candidates attempted this question and all marking points were seen. Many responses included far too much irrelevant information, especially details on the events at the pre-synaptic knob leading to the release of the neurotransmitter. Common errors included:

- naming acetyl Co A as the neurotransmitter (marking point 4)
- not being sufficiently precise as to the location of receptors (marking point 7)
- not naming the ions, or naming them incorrectly (marking points 8 and 9)
- stating that sodium ions are actively transported into the post-synaptic neurone (marking point 9)
- stating that the sodium ions enter the membrane (marking point 9)
- implying that the action potential occurs before depolarisation (marking point 13)

# 6104/01 Unit 4 Option A Examiners' Report

| | Option only | Core + Option |
|---|---|---|
| Maximum mark ..... | 30 | 70 |
| Mean mark ..... | 16.6 | 40.1 |
| Standard deviation ..... | 5.3 | 12.1 |

**Question 6**

In (a), the marking points most frequently awarded were 1 and 5; relatively few candidates went on to explain that lactic acid results in a fall in pH and the subsequent coagulation of the protein to thicken the yoghurt. Those candidates who did try and explain how the yoghurt thickened lost the mark if they talked about the milk thickening, rather than the yoghurt. There were some very detailed accounts of the symbiotic relationship between *Lactobacilli* and *Streptococci*.

The majority of candidates knew something about the role of yeast in bread production. Marking point 1 was not awarded to many candidates, as they did not state how the carbon dioxide was produced by the yeast.

**Question 7**

This was a very straightforward question, but still elicited the range of errors seen in past papers when similar questions have been asked. The most common error is to insert either the term 'retrovirus' or include 'reverse transcriptase' in the box for naming the type of nucleic acid found in HIV. A number of candidates described the structure of Lambda phage, but did not name the structure as complex.

**Question 8**

Part (a) frequently scored two or three marks out of four; these tended to be marking points 1 and 2 for naming the instrument used for inoculation, and how it could be sterilised, and marking point 4 for explaining that the necks of the tubes need flaming. Few candidates explained the importance of carrying out the procedure as quickly as possible (to reduce the risk of contamination).

The calculation did not seem to pose too many problems.

**Question 9**

This was the only really tricky question on the option section this session and caused even the stronger candidates problems. The marks awarded for this question were primarily in (a)(i) and (ii) as candidates are familiar with questions concerning the structure of Gram negative and Gram positive cell walls.

Describing the trends shown in the graph caused several problems - candidates seemed to be thrown by this new material and forgot all the exam techniques they had been taught. Some candidates omitted to state the concentrations of garlic that were having the different effects on the growth of the bacteria. Other candidates failed to tell us more than we told them in the question and simply stated what was happening to the diameter of the zone of inhibition.

Parts (c) and (d) showed a mixed response.

# 6104/02 Unit 4 Option B Examiners' Report

| | Option only | Core + Option |
|---|---|---|
| Maximum mark ..... | 30 | 70 |
| Mean mark ..... | 18.4 | 39.8 |
| Standard deviation ..... | 5.3 | 11.6 |

**General Comments**

Questions 6(a), 7(d), 9(a) and 9(b)(i) were high scoring. Questions 6(b) and 9(b)(ii) proved more difficult.

**Question 6**

(a) Most candidates knew that a lack of vitamin C leads to scurvy and they could describe symptoms of this condition. It was encouraging that many candidates could also give biochemical details such as the hydroxylation of proline to hydroxyproline. Answers to this part of the question were, in general, far superior to those seen in (b).

(b) Here it was rare for examiners to award all three marks. Answers were often vague or poorly expressed. Some referred to fibre decreasing transit time of food rather than focusing on the transit time of faeces in the colon.

**Question 7**

Although many could name the apparatus in (a), descriptions of how to use the calipers were vague and some gave an account that was simply copying information from part (d) of the question. There are still candidates who do not seem to have had experience of prescribed practical work. In (c), a significant number of candidates referred to muscles as being suitable areas for taking skinfold measurements. It was pleasing to see that the majority of candidates were able to successfully complete the calculation in (d).

**Question 8**

(a) Many candidates could give good, detailed answers showing knowledge of specific enzymes and the effect of ethene. A significant number of candidates gained at least three of the four marks available here. However, there were also many answers lacking detail. Candidates were expected to state that chlorophyll was broken down, or lycopene was produced, and it was not sufficient to just state that green pigments break down. Similarly, it was expected that answers would not just state that pectin was broken down, but would also refer to an enzyme that catalysed this process.

(b)(i) Most gained the mark in (b)(i) with the most common response being to store fruit in a modified atmosphere containing low oxygen content.

(b)(ii) There were some good suggestions in (b)(ii) with references to an increase in shelf life being the most popular response.

**Question 9**

Parts (a) and (c) proved to be very straightforward for many candidates, but a number did not answer (b)(i) in a comparative style. Here there were also a significant number that did not read values off the graph accurately when they tried to quantify their comments.

In general, (b)(ii) was not well answered. Some referred to yeast being used up while others failed to give an explanation for the shape of the graph and just described that alcohol production had reached a maximum level.

# 6104/03 Unit 4 Option C Examiners' Report

| | Option only | Core + Option |
|---|---|---|
| Maximum mark ..... | 30 | 70 |
| Mean mark ..... | 15.1 | 38.4 |
| Standard deviation ..... | 5.7 | 12.1 |

**General comments**

Questions 1, 2, 3, 4 and 5 on this Paper were common between all option papers. There was no difference between the standard of the answers to these questions compared with 6104/01 but they were answered slightly better than those on 6104/02.

**Question 6**

Responses to this question were mixed, especially to (b) where many described either arthritis or osteoporosis and as a result wrote nothing that was creditworthy. Also, lack of specificity lost candidates marks, for example they talked about arteries but not their walls, also they made reference to the narrowing of the arteries and not their lumens. Many gained marks for links to lifestyle. Part (a) saw fewer misunderstanding but many thought that TB was caused by dust or a virus and many failed to say it needed to be inhaled to cause disease. Also marks were lost due to the poor spelling of *Mycobacterium.* On a more positive note, many scored marks for the lungs and for references to lesions or tubercles.

**Question 7**

The calculation was generally well done, but the most common error was the measuring of the sarcomere rather than the H-zone as required. Part (b) was well answered by most; the most common error was the mixing up of the names of the muscle proteins and the role of ATP.

**Question 8**

Part (b) saw many losing a mark by failing to appreciate that it was a voluntary response that was required. Part (c) was overall the least successfully answered section on the paper. Few candidates failed to explain what was happening in relation to exercise and just recalled the processes of inspiration and expiration. A number of candidates also stated that muscle spindles bring about contraction and are made of actin and myosin. Those who identified them as stretch receptors only thought they worked if they were overstretched and did not grasp that they continually feedback information. There were frequent references to nerves carrying 'messages' or 'information' to the brain where the specific term 'impulses' was expected. Too few made good use of the diagram to give the locations of the stretch receptors. In (d), explanations of chemoreceptors were in relation to exercise and, as a result, many candidates gained the full two marks.

**Question 9**

This was the first time that such a question had been set on the structure of compact bone, and it was reassuring from reading many answers that candidates had a thorough grasp of the relevant details with many gaining full marks. Part (b) was not as well answered overall. In (i), the description of the graph, most picked up one or two marks for giving the general trend and a numerical statement with units. However, although many said that there was a decrease at 90 minutes of exercise, few suggested that this was an anomaly and was out of trend. Similarly, few commented on the range bars for each level of exercise. In (ii), many almost hinted at the fact that variables were not considered, but failed to state this clearly. The majority gained marks for factors that affect bone mass density. The final section saw some candidates turning the graph on its axes and suggesting that bone mass density governed the amount of exercise that could be undertaken.

# 6105 Unit 5B Examiners' Report

Maximum mark ..... 70

Mean mark ..... 33.9

Standard deviation ..... 10.3

## General comments

Overall, the performance of the candidates was disappointing. The mean mark was lower than Summer 2006. In general, candidates performed well on straightforward factual questions, but were much weaker on questions that required them to apply their biological knowledge. As in previous years, a surprisingly high number of responses were virtually illegible.

## Question 1

(a) Too many candidates simply stated that the cheese was genetically modified and did not seem to realise that it was the yeast that had been altered.
(b) Many students were very familiar with the process and were able to supply the facts, but they lacked true understanding. For example, there were statements such as 'mRNA is converted to cDNA'.

## Question 2

(a) This was answered well and many candidates achieved full marks. The genetic cross was very straightforward but lower ability candidates did make errors.
(b) This was a discriminating 'compare' question. The most common responses were: co-dominance in both, three alleles in blood groups, but only two in clover leaf pattern, $I^o$ recessive to the other two and the 4 versus 3 phenotypes. More able candidates mentioned discontinuous variation.

## Question 3

(a) The examiners considered that this was a straightforward question. The marks were given for the drawing and labelling of the location of the two processes. All other labels were ignored. However, a surprising number of candidates managed to get completely confused and added a nucleus and even mitochondria.
(b) The process of non-cyclic photophosphorylation was well understood by many. Common errors included enzymes carrying out photolysis, NAD rather than NADP, and confusion between the processes taking place on the grana with those taking place on the cristae of the mitochondria.
(c) Most candidates mentioned the light-independent process and gave details. Oxygen was often overlooked.

## Question 4

Parts of this question were well answered.

(a) Most candidates gained two or three marks with good descriptions of the structure. There was some confusion with a phospholipid and mention of hydrogen bonds.
(b) This was a discriminating question and few candidates gained five or six marks. Most appreciated that the breakdown of fats released heat and raised the temperature. Few linked temperature to oxygen. There were unnecessary accounts of the role of temperature and enzyme action.
(c) This was well answered with many gaining full marks. Some seemed not have read the question and explained that triglycerides were energy stores and described their role in plants. A number thought triglycerides could be used as steroids and hormones.

**Question 5**

This was one of the higher mark-yielding questions.
(a) In past years, this part of the nitrogen cycle has been well answered. The scenario of the compost heap seemed to put off a number of candidates. However, more able candidates described the role of nitrifying bacteria and gained two or three marks.
(b) This was reasonably well answered, although many did not mention active transport and diffusion.
(c) All parts were well answered with many candidates gaining full marks.

**Question 6**

(a) There were some unusual descriptions of biotic and abiotic factors, when all that was required was living and non-living.
(b) This was very disappointing. Candidates were expected to name an organism and a suitable habitat and then describe a technique, such as carrying out a belt transect, to determine the effect of a suitable abiotic factor on the distribution of the named organism. Even the more able candidates did not appreciate that random sampling on its own is not much use for determining a distribution. Far too many described capture-recapture or described an experiment that they had carried out in the laboratory.
(c)(i) Most candidates gained 2 marks.
(c)(ii) Many gained just 1 or 2 marks. Candidates failed to use the information presented in the graphs. There were lengthy descriptions of stomatal opening mechanisms and leaf adaptations. Few linked the stomatal opening to time of day and temperature and explained why it was important for the plant to save water and at the same time allow gas exchange to take place.
(d) The term xerophyte or an equivalent term was frequently seen.

**Question 7**

(a) Global warming has been in the news for the last six months, but it is clear that most of these candidates took little notice. There was complete confusion between CFCs and ozone, answers about the ozone layer intercepting light, descriptions of light bouncing off surfaces, blankets around the planet and much more.
(b) The trends were well described; however the reasons were not as well explained. Some appreciated that specialists would lose their habitats and have no alternatives, while generalists would adapt and colonise new habitats.
(c) Few appreciated that the butterflies would move north because the climate was getting warmer and they could survive. Most ignored the information presented in the graph, which showed the comma having a greater distribution and described the south getting too hot and the comma moving to cooler places.

# 6115 Unit 5H Examiners' Report

Maximum mark ..... 70

Mean mark ..... 30.2

Standard deviation ..... 9.6

**General Comments**

The examiners were pleased to see that in all sections of this paper good answers were seen and that both sound knowledge and understanding were demonstrated by many candidates. However, some candidates did not read questions carefully enough or take account of mark allocations to ensure that their answers were relevant or contained sufficient detail.

Questions 1, 2, 4, 5 (except 5b), 6a, 6b and 7 are common with Unit 5B.

**Question 3**

In this question, it was noticed that although candidates seemed to have some idea of required answers, poor expression denied many of marks.

In (a)(i), the descriptions of the gorilla tended to be better than those for the human. There were some poor descriptions of the opposable toe in the gorilla e.g. 'the toe is detached from the foot'. For the human, many candidates had difficulty describing the parallel arrangement of the toes e.g. 'the toes are straight'. In (a)(ii), very few candidates gained full credit. Most could give some description of the angle between the femur and the hip and the broader shape of the human pelvis. However, details beyond this were only seen on the better scripts. Many candidates referred to differences in size of various structures even though no scale is given on the diagram. Poor expression penalised many candidates in this section. Most candidates could give some idea of the ability to carry something whilst walking in (b). Only the better candidates gave a second acceptable idea. There was a noticeable number of irrelevant references to the ability to see over tall grass, or to see predators coming.

**Question 5(b)**

Candidates who realised that there would be the possibility of nitrates leaking from the compost into the stream usually gave full descriptions of the consequences. Some candidates stated that eutrophication is the final consequence when the oxygen has been depleted as a result of bacterial activity, rather than the initial nutrient enrichment. A noticeable number of candidates did not make any attempt at this section.

**Question 6**

Answers to the 5H sections of this question were extremely variable. Candidates who used good terminology and details usually scored full credit.

In (a)(i), an explanation was expected. Candidates who stated that there would be less oxygen in the blood did not gain credit. There were some good descriptions of the lower partial pressure of oxygen and its effects upon the diffusion of oxygen into the blood. References to 'thinner air' or 'less oxygen' at high altitudes were common. Most candidates gave acceptable responses in (a)(ii). Relatively few candidates gave the fine details that were required for mark points in (b). Vague references to 'more red blood cells' or 'more haemoglobin' without further qualification about the density or concentration were common. Many candidates gave good descriptions of the increased lung capacity. However, there were many vague descriptions of 'bigger chests' or 'lungs have more surface area'. Where candidates referred to increased capillaries, credit could not be given without some idea that this would be in the lungs or alveoli.

# 6106/01 Unit 6 T2 Individual Study Examiners' Report

Maximum mark ..... 32

Mean mark ..... 19.2

Standard deviation ..... 4.5

## General Points

Once again there was a good range of investigations, a large majority of which gave candidates excellent opportunities to meet all of the criteria to a high standard.

Many reports clearly represented considerable commitment on the part of candidates. However a significant number of investigation reports were extremely long and whilst examiners are always seeking to award high marks, it is not possible to do so where effort is not always well focused on the criteria. This is often characterised by over elaboration in some areas such as the inclusion of irrelevant material in Introduction or repetition of methodology in both Planning and Method at the expense of more detailed comments in Discussion and Evaluation. It would be helpful to advise candidates to consider the mark allocations more carefully when planning their time spent on this assessment.

## Planning

Centre marks were supported by examiners in the large majority of cases. The most common reason for examiners being unable to support centre marks was where it was not possible to distinguish the work of individual candidates. Disappointingly, this sometimes occurred where candidates appeared to have excellent opportunities to investigate a wide variety of hypotheses (such as on a rocky shore) yet all chose almost identical sampling techniques which they compounded by using identical means of analysis.

The inclusion of analytical phrases such as 'significant difference' or 'significant correlation' in their hypothesis would have assisted many to become more effective in achieving higher marks in subsequent criteria.

## Introduction

Many candidates could have reduced their workload and achieved higher marks by including only the theoretical background that was strictly relevant to their hypothesis. Some were clearly long passages from other sources, which were not correctly attributed. Downloads of whole sections of information should be given no credit.

## Methods

It is not intended that candidates include a second copy of a detailed method where this is already present in the plan and covers all the required sections. There were some examples of good practice where a pilot study was used to inform a detailed planned method and the additional method section was used to give details of any amendments which had been made in the light of the results of this study.

**Analysis**

There is still a surprising minority who present numerous graphs rather than the very small number accurately linked to their hypothesis. Whilst the use of running means represents good practice in selecting and justifying sample size it is rarely the most appropriate method of analysis and in some cases was clearly misunderstood.

**Discussion & Evaluation**

This was again the most challenging criterion for most candidates. Given that it carries a total of 8 marks, it is important that there is sufficient analytical comment which addresses all three sub-sections. In many lower scoring investigations this was often very short.

It would be helpful for all candidates to use sub-headings matched to D(a) (b) and (c) to ensure sufficient attention was given to each. In D(a) there was often simply a reiteration of introductory material with little direct link to the data collected or graphs drawn.

There continues to be a higher proportion of candidates who now make relevant comments about variability in their data in D(b), and there were more effective attempts to use this to assess reliability.

Objective reviews of limitations and suggestions for further work were much more variable. Many submitted only very brief comments on one of these and their marks were consequently limited.

**Style**

Whilst the application of clear indications, in context, of the use of reference material has continued to improve, the quality of the references themselves was sometimes weak. Internet references are acceptable, but it is expected that students at this level will be aware of the reliability of the sources they quote. It is expected that internet references are complete and allow the reader to access the exact web page quoted.

# 6106/02 Unit 6 W2 Written Alternative Examiners' Report

Maximum mark ..... 38

Mean mark ..... 16.0

Standard deviation ..... 4.7

## General Points

The examiners would once again like to stress that this is a written alternative to the Individual Investigation. Candidates are expected to have experience of the design and implementation of whole investigations. They are also expected to be familiar with the criteria for assessment of the Individual Investigation which are used by examiners when compiling unit tests.

A small but significant minority of candidates sought to approach this paper by simply applying previous marks schemes and invariably scored only limited marks. In extreme cases they sought to answer questions from a recent past paper which were not those posed in this examination.

Centres are strongly advised that the best preparation for this paper is for candidates to undertake small investigations of interesting questions, consider control of variables in real situations and seek to analyse and evaluate the real data they collect.

### Question 1

(a) Despite the clear instructions to the contrary in the rubric, many calculated means rather than tabulate the data in size classes.

(b) Although candidates were credited with plotting the data they tabulated in (a) some careless plotting or a failure to distinguish between bar charts and histograms meant that many did not score maximum marks.

(c) Although questions on variability have been introduced into recent papers a substantial minority of candidates clearly did not understand the term. Simple comments on the range of the data or overlap between the distribution of the data were expected.

(d) Those familiar with accurate explanations of statistical test results quickly gained maximum marks here, but a lack of accuracy limited many others. It is expected that the term 'significant difference' is used and that candidates show they understand the meaning of their answers by quoting values and demonstrate an understanding of 95% confidence levels.

### Question 2

(a) Again, attempts merely to repeat a recent question hampered many in this section. Whilst they could achieve very high marks, most plans were merely designed as a demonstration of the facts given in the rubric, rather than suggesting a method for demonstrating that it was unambiguously colour recognition. Nevertheless there were some good high-scoring answers. All of the marks scheme points were seen, but only more able candidates were able to sustain their planned approach for maximum marks.

(b) There was a disappointing lack of careful thought in this section which again indicated a determination to apply rote learning rather than personal experience of a range of investigations.

Tabulation was often inaccurate where headings failed to give a time reference, which was indicated in the method.

Many candidates made reference to statistical tests for a single significant difference, without regard for their data which typically included measurements of 4 or more different colours. Marks could have been awarded if they had explained how this might be applied, but this was not considered.

(c) Once again, lists of previously credited limitations, even where they were clearly not valid in this context, predominated. Whilst this is often a very discriminating section, it would have been beneficial for many candidates to have a wider range of experience of real investigations and considering their scientific validity.

# 6106/03 Unit 6 Synoptic Examiners' Report

Maximum mark ..... 38

Mean mark ..... 20.4

Standard deviation ..... 5.4

**General comments**

Synoptic questions are intended to give candidates opportunities to apply their knowledge and understanding to new and possibly unfamiliar contexts. The questions also require the integration of knowledge from different units of the specification content. It follows, therefore, that for success with synoptic questions candidates require both a sound recall of factual knowledge, and an ability to apply their knowledge. As an illustration, question 1 required the application of knowledge of the mechanisms for the regulation of blood glucose (Unit 4), the absorption of glucose (Unit 2), and membrane transport (Unit 1).

Both questions 1 and 2 elicited a wide range of responses, with some excellent answers. It has been noted in previous Reports that one weakness of some candidates is their inaccurate recall of some essential information from the AS units; this was again evident, particularly in question 2(c) where many candidates were unable to describe accurately the structure of sucrose. A second general difficulty of many candidates, which has been noted in other unit tests, is their failure to read the question carefully and select relevant information before writing their answers.

The standard of the essays was as variable as ever. Some contained no relevant information at all, whereas others included an impressive range of relevant specification content and appropriate examples. Some candidates appeared to be unaware that essays are expected to written as continuous prose; there were a number of attempts which included little more than a series of bullet point lists, short notes, or tabulated information. The quality of spelling, grammar and coherent expression was often rather disappointing.

**Question 1**

In (a), candidates were asked to describe and explain the change in blood glucose concentration from the start of the experiment to 30 minutes. Whilst there were many good answers, which referred specifically to the increase in concentration during this time period, there were others that gave detailed descriptions of the changes in both glucose and insulin concentrations throughout the experiment. This is a clear example of candidates failing to consider the wording of the question and to give relevant information. Some answers virtually ignored the initial rise in glucose concentration and focused on the role of insulin in the regulation of blood glucose. The answers to (b) were generally satisfactory, with many candidates commenting on the rise in the concentrations of both glucose and insulin, during the first 30 minutes, and the subsequent decrease. A number of answers were carelessly worded as candidates referred to, for example, a rise in the concentration of blood glucose occurring 'after 30 minutes', which is clearly incorrect.

Part (c) of this question proved to be a good discriminator. Some candidates virtually ignored the information given and wrote what they knew about the general effects of insulin and the regulation of blood glucose, without specific reference to the context of the question.

There were, however, some good answers where candidates clearly understood that if glycogen synthesis is promoted, the intracellular glucose concentration decreases which maintains the diffusion gradient for glucose into the liver cells.

Part (d) was often answered successfully, with the majority of candidates referring to glucagon. However, in a number of cases the spelling of glucagon was poor and suggested confusion with, for example, glycogen. Some of the descriptions of the effect of the hormone were inaccurately worded, for example stating that 'glucagon breaks down glycogen' where it would be better to state that glucagon 'promotes the breakdown of glycogen'.

**Question 2**

There were some good answers to (a), in which candidates described the effect of spraying on the both the numbers of aphids and the percentage of plants infected with virus yellows, and supported their answer with an appropriate and accurate quantitative reference. The answers to (b) were rather variable. Although many candidates calculated the percentage increase correctly, a number expressed the change as a percentage of 11.0, rather than 9.3, or simply did not know how to calculate a percentage change. Answers to (c) were surprisingly variable. Although there were many accurate descriptions of the structure of sucrose, there were also numerous answers in which either the constituent monosaccharides were named incorrectly, or the bond between the monosaccharides was named incorrectly.

Part (d) of this question discriminated well. Although many candidates correctly suggested that the transmission of nerve impulses will stop or decrease, rather fewer went on to explain how the insecticide might affect synaptic transmission. There was also a tendency to describe the role of acetylcholine, without specific references to the possible effects of the insecticide. Part (e) was usually answered quite well as many candidates were clearly familiar with the possible disadvantages of the control of insect pests using chemical insecticides. There were frequent references to, for example, the lack of specificity, chemical stability or persistence of insecticides, bioaccumulation, and the possible development of resistance of insect pests. Full marks were obtained quite often for this part, but there were also some rather poor answers where candidates attributed various inappropriate environmental effects, including eutrophication, to insecticides.

**Question 3**

Approximately 57% of candidates attempted this essay. Many of the answers included descriptions of meiosis and mutation as sources of genetic variation, and outlines of natural selection. Some of the accounts of meiosis were inaccurate and failed to explain how the events of meiosis increase genetic variation. A number of essays digressed into details of mutations as sources of genetic variation, but did not always successfully relate this to natural selection. The A2 content of these essays was often lacking in accurate details, with natural selection frequently treated rather superficially with references to the 'survival of the fittest', and to the peppered moth or Darwin's finches. There were, however, some good descriptions of different types of selection. However, when graphs were included to illustrate directional, stabilising and disruptive selection, they were rarely adequately labelled.

Good essays included outlines of how selection can result in speciation. Many candidates treated the topics in the title as two quite separate ideas; relatively few made coherent links between genetic variability, selection pressure acting on the gene pool and changes in allele frequency in a population.

**Question 4B**

This essay was attempted by approximately 36% of candidates. Although there were some good accounts of pollination and the roles of plant growth substances in the control of growth, there were also many rather poor accounts which confused pollination with fertilisation (or included much irrelevant information on fertilisation) and included the effects of auxin and gibberellins only. The coherence of these essays was often particularly poor as there was a tendency to give information about each plant growth substance under separate headings, with bullet point lists of their effects.

Good essays included details of mechanisms of pollination, related accurately to flower structure, and coherent accounts of the control of growth by plant growth substances and phytochrome. There were some pleasing accounts in which candidates successfully linked the topics together and coherently described the roles of plant growth substances in the growth, development and physiology of flowering plants.

**Question 5H**

This was the least popular choice of essay and was attempted by approximately 7% of candidates. The general standard of these essays was weaker than the previous two and tended to focus on accounts of meiosis, with few accurate details of chromosome mutations and little other relevant content from Unit 5H. It should be stressed that, in order to achieve a high mark for the essay, candidates are expected to include a good balance of material, including the A2 content. Essays typically described the process of meiosis, but the details were frequently rather poor and inaccurate, and then described mutations in general, often focusing on point mutations and their consequences. When chromosome mutations were included, polysomy and polyploidy were not always accurately distinguished. Candidates who attempted this essay often included a reference to Down's syndrome, but this was sometimes referred to, inappropriately, as a disease.

There were a few good attempts at this essay and better quality answers included accurate details of meiosis and the origins of chromosome mutations. Relevant material from Unit 5H was also integrated into these essays, including references to the detection of chromosome mutations and karyotypes.

# 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 June 2007 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 | 41 | 35 | 30 | 25 | 20 |
| 6102 Unit 2B | 60 | 47 | 43 | 39 | 36 | 33 |
| 6112 Unit 2H | 60 | 45 | 41 | 37 | 33 | 29 |
| 6103 Unit 3 | 70 | 46 | 40 | 34 | 28 | 23 |
| *Paper 01 T1* | *32* | *26* | *22* | *18* | *15* | *12* |
| *Paper 03* | *38* | *20* | *17* | *15* | *13* | *11* |
| 6103 Unit 3 (International option) | 70 | 40 | 35 | 30 | 25 | 21 |
| *Paper 02 W1 International only* | *32* | *20* | *17* | *14* | *12* | *10* |
| *Paper 03* | *38* | *20* | *17* | *15* | *13* | *11* |
| 6104 Unit 4 Option A | 70 | 52 | 47 | 42 | 37 | 33 |
| 6104 Unit 4 Option B | 70 | 52 | 47 | 42 | 38 | 34 |
| 6104 Unit 4 Option C | 70 | 51 | 46 | 41 | 36 | 32 |
| 6105 Unit 5B | 70 | 44 | 40 | 36 | 32 | 29 |
| 6115 Unit 5H | 70 | 44 | 40 | 36 | 32 | 29 |
| 6106 Unit 6 (Option 1) | 70 | 49 | 44 | 39 | 35 | 31 |
| *Paper 01 T2* | *32* | *24* | *21* | *18* | *15* | *12* |
| *Paper 03* | *38* | *25* | *23* | *21* | *20* | *19* |
| 6106 Unit 6 (Option 2) | 70 | 45 | 41 | 37 | 33 | 29 |
| *Paper 02 W2* | *32* | *20* | *17* | *14* | *12* | *10* |
| *Paper 03* | *38* | *25* | *23* | *21* | *20* | *19* |

APPENDIX B

# The Uniform Mark System for AS and A level Unit Schemes

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

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

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

**Table 1 – Advanced Subsidiary Subjects**

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

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

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

**Table 2 – Advanced Level Subjects**

| Subject | | Unit Weighting | | | | |
|---|---|---|---|---|---|---|
| **Grade** | **UMS** | **15%** | **$16^{2}_{3}$%** | **20%** | **25%** | **30%** |
| Max mark | **600** | 90 | **100** | 120 | 150 | 180 |
| A | **480** | 72 | **80** | 96 | 120 | 144 |
| B | **420** | 63 | **70** | 84 | 105 | 126 |
| C | **360** | 54 | **60** | 72 | 90 | 108 |
| D | **300** | 45 | **50** | 60 | 75 | 90 |
| E | **240** | 36 | **40** | 48 | 60 | 72 |

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

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

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

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

Further copies of this publication are available from
Edexcel Publications, Adamsway, Mansfield, Notts, NG18 4FN

Telephone 01623 467467
Fax 01623 450481

Email publications@linneydirect.com

Order Code UA018980 June 2007

For more information on Edexcel qualifications, please visit www.edexcel.org.uk/qualifications
Alternatively, you can contact Customer Services at www.edexcel.org.uk/ask or on 0870 240 9800

Edexcel Limited. Registered in England and Wales no.4496750
Registered Office: One90 High Holborn, London, WC1V 7BH