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Examiners' Report January 2007

GCE

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

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6101 Unit 1 Examiners' Report

Maximum mark 60

Mean mark 30.2

Standard deviation 10.2

General Comments

Questions 3(a)(ii), 5(a)(i) and 5(b) were relatively high scoring. Questions 3(b), 6(b)(i) and (iii), 7(a)(ii), 8(a) and 8(c)(ii) were low scoring.

Question 1

Many candidates gained three out of the four marks available, but few were able to gain full marks. There was no obvious indication that one particular statement was more problematic than the others.

Question 2

The majority of candidates gained two marks for knowing the names of bonds. Most were also familiar with the term dipole. The most common reason for losing a mark was because of confusion between the terms latent heat and specific heat capacity.

Question 3

Poor expressions often prevented candidates from scoring both marks in (a)(iii). Common errors were referring to nucleotides rather than bases or for using inappropriate terms such as 'opposite' or 'corresponding' when trying to describe the complementary relationship between codon and anticodon. Few gained more than one mark in (b) and a significant number made no attempt to answer this question. When credit was awarded, it was usually for a comparison of shape or for knowing that hydrogen bonds were present in tRNA.

Question 4

Generally well answered, but a large number of candidates saw the word ribosome in the second description and immediately named the structure as rough ER instead of nucleolus.

Question 5

(a) A large number of candidates ignored the instruction to write only the first five bases and listed all twenty one bases. Others wrote down the first fifteen suggesting they were confusing codons with bases.
(b) This was well answered with many giving thorough, coherent accounts of their reasoning. The most common error was to calculate 100 – 29.4 and then simply to divide by three.

Question 6

(a) There were a few good answers but most only gained credit for referring to cellulose. Many focused on the structure of cellulose molecules rather than the structure of the cell wall. Some described cellulose being made of microfibrils while a significant number described the structure of the cell membrane, rather than the cell wall. In (b)(i), answers were mainly just references to an absence of enzyme. Poorly expressed answers prevented examiners from awarding marks in (b)(ii). There was a large number of answers that referred only to samples and not to particular enzymes. In (b)(iii) many responses were just accounts of enzyme action with descriptions of active sites, lock and key mechanisms etc. Others thought that the enzymes made the juice. The most commonly awarded marks were for knowing that the cell wall was broken down and for being able to name a relevant enzyme.

Question 7

Part (a)(i) was often answered well but weaker candidates failed to quote temperatures precisely enough. Others attempted to describe the rate of change of colour even though there is no reference to time on the axes of the graph. In (a)(ii), many answers focused on kinetic energy and movements of water or pigment molecules with no mention of the membranes of the cell. There were some good descriptions of active transport in (b) with a significant number of candidates able to gain all five marks. The majority of candidates gained marks for describing movement against the concentration gradient and the need for ATP.

Question 8

It was disappointing that very few candidates were able to give clear descriptions of a suitable method in (a). For many the only mark gained was for knowing that they would use iodine as a test for starch. Some, however, described the use of Benedict's reagent. Many failed to give details of the control of variables. Some described methods in which there was no mention of starch being present. In (b) most gained a mark for recognising the decrease in activity as incubation time increased. The only other mark commonly awarded was for stating that there was no activity after five minutes. In (c)(i) there were many good descriptions of tertiary structure although poorly expressed answers sometimes prevented examiners from awarding marks. For example candidates referred to the structure being globular 'or' fibrous; or correctly named disulphide bridges, but then said 'between the chains'. Most answers in (c)(ii) failed to take into account the idea of a longer time at 60°C. The only commonly awarded mark was for a reference to the distortion of the active site.

6102 Unit 2B Examiners' Report

Maximum mark	60
Mean mark	38.6
Standard deviation	8.5

General comments

This was considered to be an accessible and straightforward paper, giving candidates opportunities to show their knowledge and understanding of a range of topics from the specification. Several questions, or parts of questions, were usually answered well by the majority of candidates, whilst others were more discriminating.

In general, questions 1, 2, 4(a)(ii), 5, 7 and 8(b) were answered well. Questions 3(a), 4(a)(i), 6 and 8(a) proved to be more difficult for candidates. The standard of answers to the other questions was variable, but there were none that appeared to be inaccessible to the majority of candidates.

In a number of instances, answers were poorly worded, giving rise to ambiguity or to inaccurate biology. It is clearly important for candidates to consider their answers carefully. One of the skills being tested in the questions is the candidates' ability to select relevant information. There is a general tendency to include much irrelevant information in the answers, without answering the question as specifically asked. For example, in question 5, many of the explanations of the term transpiration included details of the uptake of water, transport in xylem and the transpiration stream.

Question 1

This was a high-scoring question, and many candidates scored all four marks here. One common error, however, was in completing the third space where many vessels, other than the coronary arteries, were seen. The first and last spaces were the most frequently correctly answered.

Question 2

The answers to (a) were rather variable, but many candidates were able to name correctly the villus, crypt (of Lieberkuhn) and muscularis externa. There were some detailed answers to (b), which readily gained full marks. However, this was an example of lack of selectivity of information in the answers, as many included irrelevant details of carbohydrate digestion, without focussing specifically on the uptake of glucose. Some of the answers to this part were poorly worded, such as references to villi being 'surrounded' by capillaries, where villi 'contain' capillaries is more accurate.

Question 3

In (a), many candidates referred correctly to the reversible affinity of haemoglobin for oxygen, and a number of answers correctly qualified this with reference to the change in affinity at high and low partial pressures of oxygen. There were also some good descriptions of cooperative bonding. A number of candidates stated, correctly, that haemoglobin is involved in the transport of carbon dioxide, but then named the compound formed as carboxyhaemoglobin, rather than carbaminohaemoglobin. There was also some confusion between the numbers of atoms, or molecules, of oxygen transported by a molecule of haemoglobin. Previous Examiners' Reports have referred to the evident confusion between haemoglobin and red blood cells by a number of candidates. This was also apparent this January, where a number of explanations related to red blood cells. Almost all candidates read the value correctly from the graph in (b)(i), and many gained at least one mark in (b)(ii). This was usually for stating that fetal haemoglobin has a higher affinity for oxygen than adult, or maternal, haemoglobin. However, the significance of this was sometimes less well appreciated, or expressed rather vaguely. The Examiners expected a clear reference to the transfer of oxygen from the adult haemoglobin, or blood, to the fetal haemoglobin. One mark was also available for indicating that the percentage saturation of fetal haemoglobin with oxygen is higher than the percentage saturation of adult haemoglobin, at the same partial pressure of oxygen, but few candidates made this point.

Question 4

It was clear that the majority of candidates were more familiar with the functions of oxytocin than the functions of oestrogen, as they generally scored better in part (a)(ii) than in (a)(i). Although a number of candidates gained a mark in (i) for reference to repair of the endometrium, the other mark points were seen less often. Although it was clear that many candidates recognised the involvement in the control of LH secretion, the inhibitory effect at low concentrations of oestrogen was rarely described. In (ii) however, candidates readily gained marks for descriptions of the effects of oxytocin in parturition and lactation. In (b)(i), most candidates were able to gain one mark for a description of the changes in the concentration of progesterone; better candidates supported their answer with an appropriate quantitative reference, and gained both marks. In (b)(ii), there were many correct references to maintenance of the endometrium and to inhibition of FSH or LH. However, there were also several carelessly worded answers, referring to, for example, 'repair and maintenance' or to the 'lining of the endometrium'.

Question 5

Part (a) was well answered by the majority of candidates, who referred to the evaporation of water, or the loss of water vapour, and included a named aerial part of a plant. There was a tendency here to give more information than was required, with descriptions of the transpiration stream. Part (b)(i) was also generally answered well, with the majority of candidates able to give two appropriate xeromorphic adaptations. The answers to (b)(ii) were more variable, as a number of candidates gave general hydrophyte features, without specific differences from the leaf shown. Some answers also included references to the roots or stems, rather than features of the leaf.

Question 6

In (a)(i), many candidates correctly recognised the inverse relationship between temperature and the concentration of dissolved oxygen. However, this was less often supported with an appropriate quantitative reference. When describing data from a table, such as in this question and in question 4(b)(i), candidates are expected to support a generalised description with a manipulated quantitative comment. Many candidates successfully related the data to (a)(ii) and suggested that the concentration of dissolved oxygen in water of tropical areas is likely to be low, as a result of the high temperature. However, the other mark points were made less frequently. There were also some strange suggestions, which indicated that candidates tried to apply their knowledge of the adaptations of invertebrates to low oxygen concentrations. In (b), many candidates gained one mark for a reference to gas diffusion, but this was less often supported with reference to the cell surface membrane, or an explanation of how the diffusion gradients are maintained.

Question 7

There were some good, accurate and concise answers to (a), including references to both the transfer of pollen and to the anther and stigma, which readily gained both marks. This is another example of where candidates tended to give more information than was required, as a number of answers included irrelevant additional information on the subsequent growth of a pollen tube, and double fertilisation. Part (b)(i) was also answered quite well; many candidates were able to identify correctly the petal and stigma, although part Q was sometimes identified incorrectly as an anther. Part (b)(ii) was also high-scoring, as the majority of candidates were able to describe the role of the petals in insect pollination. Fewer included accurate references to part R in their answers and, again, there was a tendency to include irrelevant details of fertilisation here.

Question 8

In (a), the trachea was better known than the bronchus as there were many references to bronchioles (or other incorrect structures). Part (b) was high-scoring, as candidates who described the mechanism of inspiration readily gained all three marks. Indeed, there were some very detailed accounts from candidates who clearly had a good knowledge and understanding of the process of inspiration. Part (c) proved to be more difficult and, although a number of candidates correctly described the difference in the percentage of oxygen, relatively few were able to offer an accurate explanation for this. Some answers, for example, referred to the uptake of 'air', rather than oxygen specifically. The answers to (d) were rather variable. Candidates who were familiar with the structure of alveoli and adaptations for gas exchange generally scored well, but there were also some rather vaguely worded answers. As an example, a number of candidates suggested that alveoli have 'thin cell walls'. Whilst the intention is clear, this statement is ambiguous, and the Examiners would expect a statement that alveoli have a wall consisting of flattened epithelial cells. There were, however, a number of detailed answers which gained maximum marks, showing good knowledge of this topic.

6112 Unit 2H Examiners' Report

Maximum mark..... 60

Mean mark 34.9

Standard deviation 9.2

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

The vast majority of candidates correctly identified the decrease in the partial pressure of oxygen for part (a) as a single word answer was appropriate. However, few candidates went on in (b)(i) to state specifically that the partial pressure was low; many referred to low oxygen concentration or the scarcity of oxygen in the atmosphere, so it was unspecific terminology that lost them the mark. It was reassuring to see in (b)(ii) that most identified the increase in the number of red blood cells and the resultant increase in haemoglobin, but there were few accurate references to carrying capacity. Part (c) had many alternatives and those that talked about increased pigment and more body hair generally scored full marks. Those that told us that lung volume or breathing rate increased more often scored only 2 marks as they failed to include in their answer that the result of this increase was so more air could be breathed in. Few candidates misread the question and gave answers more appropriate to (b)(ii) or gave details of changes to the heart. This question part was also where the most blank answers were seen where candidates had failed to make any suggestions.

Question 6

Part (a) generally scored full or no marks. Most candidates lost marks as they simply said that the pacemaker took over the role of the SAN and then went through the cardiac cycle detailing the conduction of the impulse and the contraction of the atria followed by the ventricles. Some candidates did pick up point 1 in this description by pinpointing the fact that the pacemaker generates or sends out impulses, but failed to state that this causes the ventricles to contract. Mark point 3 was not made clearly by many as they simply said it regulated heart rate and not caused the heart to beat rhythmically or regularly. Point 4 was not seen often as candidates stated that the SAN or AVN did not work, rather than that it had been damaged in some way. The T wave was correctly identified by most and on the whole the calculation was done well, with only a few candidates not scoring full marks. Common errors were only counting four complete cardiac cycles and failing to take into account that the five cycles counted were in five seconds, and not per second.

Question 7

On the whole, (a)(ii) was better done than (a)(i). Many candidates confused osteoarthritis with osteoporosis so failed to gain any credit. Those that did correctly describe osteoarthritis gave all three mark points for a maximum of two. In (ii), the most common points scored were the age range and the fact that the menstrual cycle or ovulation stopped. Many made reference to oestrogen and progesterone but failed to gain mark point 2 as they said that secretion stopped rather than that it was reduced. Those that mentioned FSH and LH usually did so correctly but had already scored maximum marks.

In (b), nearly all candidates correctly said that the incidence increased with age, but failed to notice the decrease at 60+. Also, some were not credited because of the ambiguous nature of their answers, e.g. the highest incidence was 'after 60 years'. Also, many answers were seen where candidates had tried to compare the incidence in men and women which was actually what was asked in part (b)(ii), so ended up losing marks on both sections as they did not repeat their answer to (i) in (ii).

Those candidates that did distinguish between the two parts generally scored highly in (ii), commonly identifying points 1 to 4 for a maximum of two.

Question 8

Common with 6102

6103/01 Unit 3 T1 Individual Investigation Moderators' Report

Maximum mark..... 32

Mean mark 20.6

Standard deviation 4.8

General Comments

The moderators were able to support many of the marks awarded but a significant number of centres were likely to require some adjustment to match a common standard. The overall pattern of entry in January is much more varied than in June and the moderators seek to maintain a common approach by revisiting archive material and comparing it with current samples.
It would be helpful to note that work submitted for remoderation should contain some substantial extra practical work. Moderation is carried out on the cohort from each centre as a whole. Where the entry is large this is done by sampling according to QCA guidelines. Therefore work submitted for remoderation will often be considered in the context of a completely different sample. For this reason the outcome of the moderation process, for any individual candidate, may well be different from a previous occasion. Centres are therefore advised to consider carefully all the implications of submitting work for remoderation rather than requesting a transfer of previously moderated marks.

Planning

The moderators have often stated that this is the most important feature of successful investigations. For higher marks it is expected that candidates will show significant progression from GCSE standards. Unfortunately this was not always the case, especially for catalase investigations which frequently had simplistic justification and no temperature control.

In contrast there were also some excellent attempts to investigate common hypotheses in interesting ways with a clear understanding of AS standards.

Implementing

Marks in this section tend to be a little higher than others. Whilst moderators accept centre marks for I(a) and I(b) it is important to justify these with clear annotation. Some centres do not always take full account of I(c) which the moderators check against the quality of raw data tabulation.

Analysis

It is essential for graphical presentation to be both directly linked to the main hypothesis and selective for A(a)6+. Many candidates are tempted to plot all their raw data, sometimes neglecting the most relevant graph. This is common where readings are taken over time (e.g. volume of gas collected) but not converted to a rate.
Only more able candidates are able to apply their knowledge and understanding to explain the actual data collected for A(c)6 rather than simply repeating a standard explanation, leaving the reader to apply this to the actual data.

Evaluating

Whilst there continues to be an increased awareness of the requirements for E(a), many still put little emphasis on the pattern shown by the repeat readings in their data. It would be helpful for many to begin to address the criterion in this way as it is difficult to support the award of E(a)4 without it. Similarly, linking comments on variability in the data directly to a consideration of what aspects of variable control, and the techniques employed may be the main cause of such differences would help many on the path to higher marks in this section.

6103/03 Unit 3 Paper 3 Examiners' Report

Maximum mark..... 38

Mean mark 22.5

Standard deviation 5.6

General Comments

This paper seemed to be reasonably accessible. It is pleasing that most candidates were able to gain some credit on all sections and some excellent answers were seen throughout the paper. There were relatively few scripts with sections left blank. It is disappointing that many candidates do not gain some marks as a result of poor expression or lack of attention to detail.

Question 1

In (a), almost all candidates gave a suitable energy unit. References to volume or mass were ignored. However, some candidates included an inappropriate reference to time or rate.

In (b), suitable terms were given by most candidates. A common error was to state that bacteria are tertiary consumers.

In (c)(i), it was pleasing that many candidates concentrated upon the energy losses by *Tribolium* and were able to gain full credit. However, some candidates did not read the question carefully and concentrated upon the wheat seeds. Many references to energy being 'used in' or 'needed by' respiration were seen. Answers to (c)(ii) were quite variable. It was expected that candidates would follow the idea of the seeds being dead or dormant with a relevant comment about their inactivity. However, many candidates assumed that the seeds would still be photosynthesising and that this would balance any other energy losses in the trophic level.

Question 2

The descriptions of the changes in (a)(i) were usually clear and acceptable. Some candidates were penalised by a lack of attention to detail. Common errors included calculations of the loss over the entire time period, referring to weeks rather than days and using incorrect readings taken from the graph. Answers to (a)(ii) were extremely variable. Candidates who understood the term saprobiont, and stated the need for the food source to be dead, tended to score full marks. There were some very vague ideas given by some candidates about saprobionts 'waiting for the leaves to decompose'. Answers to (a)(iii) were usually correct.

In (b), there was a large number of very good, detailed answers where candidates applied their knowledge of *Rhizopus* nutrition well. Some of these answers were penalised by incorrect use of some terms. These included references to enzymes being excreted and the products of digestion being absorbed by osmosis. Many candidates described the appearance of the leaf after 28 days but did not compare it

with the fresh leaf. There was a significant number of references to changes in colour, even though the pictures do not give this information.

In (c), most candidates realised that waterlogging or compaction would remove the air from the compost. A specific reference to a lack of oxygen, or anaerobic conditions, was given by better candidates. However, this was often followed by a vague reference to limitations to respiration rather than aerobic respiration. There were some very good answers that included references to the possibility of an increase in denitrification.

Question 3

In (a), most candidates gave an acceptable definition. The most common error is to use the term energy as equivalent to mass. As in Q1(a), some candidates included references to a rate in their definitions.

In (b), most candidates gave an acceptable answer. The most common error was to refer to the poplars as a fast-growing species without any comparison with the rate of growth of the native species.

In (c)(i), Yeghegnute was usually identified as the most unsuitable site, but many of the explanations were too vague. Many candidates did not make a clear reference to the fact that every hybrid had its slowest growth rate in this region. In (c)(ii), most candidates gave two acceptable suggestions. However, some candidates gave two soil differences rather than two distinct differences.

Part (d) was generally answered quite well with most candidates able to gain two or three marks. Vague references to trees protecting the soil without further qualification and general statements about trees holding soil together were not credited.

In (e)(i), most candidates were able to calculate a value. However, since the figure in the stem of the question is given to two decimal places, it was expected that the final answer would be converted to this. A noticeable number of candidates did not attempt the calculation. In (e)(ii), most candidates could make an initial comparison of the efficiency of the two processes. Many candidates also stated a reasonable quantified comparison. Only the better candidates made valid comparisons of the waste heat and ash produced.

In (f), most candidates were able to gain two or three marks. References to the possible effects upon habitats, biodiversity and food chains were the most popular answers. It is disappointing that some candidates still refer to organisms losing their homes, rather than habitats.

Part (g) proved to be more discriminating than was expected. A straightforward statement that the ethanol, referred to in the question, is mixed with petrol in the correct proportions, would have gained full credit. Many candidates gave long descriptions of the conversion of starch to sugar and the fermentation process or included environmental benefits of using gasohol. In many of these cases, the details of the final production of the gasohol were omitted. A large number of candidates did not give a specific reference to the use of petrol or gasoline in the mixture.

6104 Unit 4 Core Examiners' Report

	Core information for: Option A	Option B	Option C
Maximum mark	40	40	40
Mean mark.....	23.4	22.0	23.2
Standard deviation	7.4	7.5	7.6

Question 1

A disappointing number of candidates could neither indicate nor state the location of the hypothalamus. Many could give two functions of this structure. The most frequently seen incorrect answer was a reference to control of either heart or breathing rate.

Question 2

The responses to (a) were variable. Many high scoring answers were seen in (b) with the better candidates scoring 4 max. Commonly seen errors included 'rhodopsin' changing shape and 'depolarisation' of the rod cell. A number of candidates still fail to state that rhodopsin *absorbs* light.

Question 3

For a question on the kidney, this was relatively well answered. Many candidates picked up two or three marks in p(a) and (c). Part (b) caused a few more problems with only a few candidates being able to express their answers accurately enough to gain both marks. A significant number of responses suggested that the reabsorption of glucose affected the sodium ion concentration and candidates are still using the term 'amount' in their responses, rather than a more precise term such as concentration.

Question 4

In (a)(i), a large number of candidates lost marks through poor exam technique: many described the changes in bolus insulin concentration and then described the changes in concentration in basal insulin, failing to make actual comparisons between the two. Some candidates, who tried to compare each change in one sentence, only quoted figures from the graph, failing to describe the differences in the changes occurring.

Responses to the rest of the question were variable but most candidates picked up marks, especially in (b) which was a relatively straightforward calculation. Disappointingly, there are still many candidates stating that 'insulin converts glucose

to glycogen', failing to appreciate the difference between converting and *stimulation* of the conversion.

Question 5

This was a well-answered: centres have clearly been using previous mark schemes to train their students. All marking points were frequently seen and often well-worded, with most candidates coping with the oxidation and reduction reactions correctly. A number of candidates gave very accurate and detailed accounts that were beyond the requirements of the specification. Probably the most common error was stating that carbon dioxide is produced when pyruvate is reduced to lactic acid.

6104/01 Unit 4 Option A Examiners' Report

	Option only	Core + Option
Maximum mark.....	30	70
Mean mark	16.1	39.5
Standard deviation	5.	11.6

Question 6

Responses were variable for this question, with few candidates scoring full marks. In (a) candidates could state that selective media encouraged the growth of some microorganisms or inhibited the growth of others but could not go further and give a reason for its use. In (b) some responses were too vague, stating that stirrers mixed the media or the solution. Part (c) was answered better but some candidates stated that the nitrogen source is for growth *and respiration.*

Question 7

This question caused difficulties for some candidates. The usual confusion was seen in (a)(i) between RNA and DNA and in (ii) some candidates did not pick up on the idea that they were being asked to name the *molecule* making up the capsomere. Part (b) was poorly done; wording was poor and many candidates confused latency up with cell infection cycle.

Question 8

This was a very discriminating question. Part (a) was the only section where good answers were frequently seen. In (b)(i) there were many answers that simply described the number of bubbles being produced by each type of yeast with each carbon source, failing to use the data to comment on the fermentation of glucose and lactose. A number of candidates thought that 195 bubbles represented lactose usage and that the relatively small differences in the number of bubbles produced in the other tests represented significant differences in fermentation.

Part (c) scored poorly, as do many questions directly testing candidates on practical work. A significant number failed to identify that they were supposed to describe an *optical* method and described dilution plating. Many described the use of a haemocytometer and, although there were marks allowing for this, they were rarely awarded. Even those candidates who recognised that a colorimeter was a suitable piece of equipment to use could not describe how to use it in the context of this question.

Question 9

This was a much higher scoring question, although there were still candidates determined to press the log button on the calculator and take log of logs. In (b)(ii), candidates did not have to comment on the composition of the cell wall of fungi, but it was pleasing to see how many actually knew the correct composition.

6104/02 Unit 4 Option B Examiners' Report

	Option only	Core + Option
Maximum mark.....	30	70
Mean mark	13.3	35.4
Standard deviation	4.6	10.8

General Comments

Questions 6(a), 8(b) and 9(a)(i) were high scoring. Questions 6(b), 7(a)(i) and (ii) and 9(b)(ii) proved difficult.

Question 6

In (a) candidates were often able to give a suitable temperature but then many only referred to killing pathogens or most bacteria. Answers failed to emphasise killing all bacteria. Often a mark was lost in (b) because they did not appreciate the packaging as a barrier to microorganisms. Examiners noted good, detailed answers in (c).

Question 7

The majority failed to identify correctly a suitable bond in (a)(i), and did not give sufficient accuracy in (ii). All the bonds visible in the diagram would be glycosidic, so a more precise answer was expected. Poor expression let some candidates down in (b). For example, examiners were not always able to tell if candidates were referring to the fructose, or to food products, having a lower calorific value. However, many candidates correctly gave high fructose corn syrup as an example of a product made using the enzyme.

Question 8

Once again, the practical based question on this option proved to be the most difficult. It was disappointing in (c)(i) that many candidates seemed to lack experience of practical work. Many failed to refer to controlling any variables and a significant number were unable to state a suitable method for measuring pH. In (a) most could state the time when there was no change in pH but fewer gave correct references to the effect of pH on thickness. There were some good answers to (b) with about half the candidates gaining all three marks available. Most were able to refer to lactase and could describe the problems when it was not present.

Question 9

In (a)(i), the majority described the relationship between age and protein requirement, but fewer could give clear explanations. Although many answers referred to growth, there was a lack of clarity and candidates must make their meaning clear to gain credit. The calculation in (b)(i) required candidates to link information from the graph and the table of data. A significant number were unable to use both sources of information. The most common error was to ignore the graph and attempt a calculation on data from the table only. In (b)(ii) candidates often attempted to describe a lack of essential amino acids, although a number did refer to a high fat content.

6104/03 Unit 4 Option C Examiners' Report

	Option only	Core + Option
Maximum mark.....	30	70
Mean mark	15.7	38.9
Standard deviation	5.0	11.6

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.

Questions 1 to 5

Core question common to 6104/01 and 6104/02

Question 6

Part (a) was not well answered in the main; too many candidates went into too much detail that they did not know well enough. The most common misconception was that B-cell, rather than plasma cells, secrete antibodies. Additionally candidates lost marks for implying that lymphocytes also performed phagocytosis. Candidates that kept it simple on the whole scored full marks. Part (b) was either known very well with many candidates going into great detail for which they were rightly credited with two marks. Whereas, others thought that a muscle spindle was made up of actin and myosin and was responsible for contraction so failed to score at all, as the reference to contraction was out of the context of the correct answer. Part (c) showed that best response with the majority of candidates giving good descriptions of the production of ATP, but many failed to say that this occurred in the muscles.

Question 7

A well answered question with many candidates giving great detail on both osteoarthritis and rheumatoid arthritis. Some candidates however, misread the question and described the features of a joint, so failed to score on (b).

Question 8

Part (a) saw many candidates giving good definitions, but for some it was the use of unspecific terminology e.g. amount of breaths, which meant that they did not gain the marks. The descriptions of the graphs in (b)(ii) saw some mixed answers; some tried to compare the lines. Others incorrectly said that changes occurred faster or slower, or made reference to rates of change. None of these was acceptable as time was not the variable on the x-axis so changes needed to be noted as being steeper or having a shallower or sharper gradient. Having said this, the majority of candidates did score two marks. The drawing of the curves on the graphs was well done and most candidates knew how to calculate minute volume in (c), but fewer were able to go on and give details from the graphs.

Question 9

The calculation was answered well with nearly all giving clear workings. The most common error was reading data from the graph for strength events rather than endurance. In (c), calcium ions scored more highly than myoglobin. Many candidates gave full details of the interactions of not only actin and myosin but additionally troponin and tropomyosin. For myoglobin the majority knew that it was an oxygen store, but then got tied up in that oxygen was needed for ATP production and then described the role of ATP in muscle contraction rather than myoglobin.

APPENDIX A

UNIT GRADE BOUNDARIES AND UNIFORM MARKS

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

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

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

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

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

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

Unit grade boundaries for January 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
6101 Unit 1	*Raw marks* 60	39	34	30	26	22
6102 Unit 2B	60	46	43	40	37	34
6112 Unit 2H	60	45	41	38	35	32
6103 Unit 3	70	54	48	42	36	31
Paper 01 T1	*32*	*26*	*22*	*18*	*15*	*12*
Paper 03	*38*	*28*	*25*	*23*	*21*	*19*
6103 Unit 3 (International option)	70	47	42	38	34	30
Paper 02 W1 International only	*32*	*19*	*17*	*15*	*13*	*11*
Paper 03	*38*	*28*	*25*	*23*	*21*	*19*
6104 Unit 4 Option A	70	52	47	42	37	33
6104 Unit 4 Option B	70	48	43	38	33	29
6104 Unit 4 Option C	70	51	46	41	36	32
6105 Unit 5B	70	46	41	36	32	28
6106 Unit 6 (Option 1)	70					
Paper 01 T2	*32*					
Paper 03	*38*					
6106 Unit 6 (Option 2)	70	51	46	41	36	31
Paper 02 W2	*32*	*24*	*21*	*18*	*15*	*12*
Paper 03	*38*	*27*	*25*	*23*	*21*	*19*

APPENDIX B

The Uniform Mark System for AS and A level Unit Schemes

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

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

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

Table 1 – Advanced Subsidiary Subjects

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

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

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

Table 2 – Advanced Level Subjects

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

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

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

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

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

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