

Examiners' Report January 2008

GCE

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

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Contents

			pg
Unit 1	6101	Molecules and cells	1
Unit 2B	6102	Exchange, transport and reproduction	3
Unit 2H	6112	Exchange, transport and reproduction in humans	6
Unit 3	6103/01 T1	Individual investigation	8
	6103/03	Energy and the environment	11
Unit 4	Core material	Respiration and coordination	13
	Option A	Microbiology and biotechnology	15
	Option B	Food science	17
	Option C	Human health and fitness	19
		Appendix A: Unit Grade Boundaries and Uniform Marks	21
		Appendix B: The Uniform Mark System	23

6101 Unit 1**Examiners' Report**

Maximum mark..... 60

Mean mark 35.0

Standard deviation 10.5

General comments

Questions 1, 2, 3(a)(i) and (ii), 4(a), 5(a), 6(b)(i) and 8(b) were relatively high scoring. Questions 3(c), 6(b) (iii), 7(b) and (d) were low scoring.

Question 1

Many candidates gained at least three out of the four marks available. There was no obvious indication that one particular statement was more problematic than the others.

Question 2

A straightforward question, allowing most candidates to gain at least three marks.

Question 3

Part (a)(i) was straightforward for the majority of candidates, but weaker answers included limited statements about the primary structure being the first stage of protein structure. In (c), candidates often gained a mark for identifying collagen as fibrous and insulin as globular. It was disappointing that few candidates were able to make other valid statements and it was worrying that so many referred to carbohydrate structures such as the presence of α - glucose.

Question 4

Part (a) was generally well answered, but in (b) it was clear that many candidates have had little experience of drawing plans. Few included the correct number of tissues and many were unable to produce a drawing of the correct dimensions.

Question 5

All three sections of (a) were mark yielding, which indicated candidates are used to identifying stages of mitosis from photographs or diagrams. Part (b) was well answered with many giving thorough, coherent accounts of the phases. However, others thought that the spindle forms during metaphase and that separation of chromosomes also occurs at that stage. Incorrect terminology was evident with confusion between centromeres, centrioles and chromatids. Some answers suggested candidates might have been describing meiosis, rather than mitosis, because there were references to chromosomes pairing, or lining up in pairs.

Question 6

Part (a) had some good diagrams, but in general drawing skills were weak. Many labelled the chloroplast envelope as the cell membrane or cell wall while a significant number included a nucleus in the chloroplast. In (b)(i), most candidates correctly measured the length of the mitochondrion and could often go on to divide this value by 50 000. However, significantly fewer candidates could correctly convert their answer to the correct units. About half of the candidates were able to suggest a suitable structure in (b)(ii), but incorrect answers that were commonly seen included the Golgi apparatus and the nucleus. Part (b)(iii) was poorly answered with only a minority referring to poor resolution, or occasionally to damage during preparation. There were a considerable number of answers in which the candidate was unable to decide whether the cause was due to low resolution or low magnification and so unfortunately wrote down both answers.

Question 7

In (a), a large number of candidates could gain credit only for naming a suitable reagent that could be used. They did not give any experimental details and when suggesting that iodine solution should be used, they were often unable to state the correct colour change. It was disappointing that so many answers in (b) only referred to the time for starch breakdown and failed to make any statement about the activity of amylase. Others incorrectly equated an increase in time taken with increased activity. There were some very good accounts of active site-directed inhibition in (c), but several candidates seemed to describe non-active site-directed inhibition by describing a change in shape of the active site. Inaccurate descriptions of the inhibitor being the same shape as the active site were also fairly common. In (d)(i), there was much confusion about the meaning of initial rate and a significant number thought it was some kind of control. Part (d)(ii) was very poorly answered and it was rare for Examiners to be able to award a mark.

Question 8

For (a), it was disappointing that so many candidates named B as a pentose sugar, rather than the more precise deoxyribose. Both sections of (b) were very high-scoring. Some candidates even referred to Chargaff's rule in their explanations in (b)(ii), which was pleasing to see. In (c), a reasonable number of candidates gained one mark for a suitable reference to genetic information or to the idea of DNA acting as a template in protein synthesis. However, large numbers of candidates gave very vague statements such as 'DNA controls the cell'. In (d), it was noted by Examiners that far fewer candidates confused transcription and translation than in previous years. The answers, however, often lacked clarity, particularly when trying to describe complementary base pairing. Many described mRNA pairing up with DNA. Some answers implied that all of the DNA unwinds and that both strands act as templates. There were also inaccurate descriptions of the role of enzymes with helicase, ligase and RNA polymerase involvement being confused.

6102 Unit 2B**Examiners' Report**

Maximum mark..... 60

Mean mark..... 34.5

Standard deviation..... 10.0

General comments

This proved to be a generally accessible paper, giving candidates opportunities to show their knowledge and understanding of the content of Unit 2B. In general, candidates coped well with the majority of questions and, although some parts were discriminating, there were no parts of questions which proved to be inaccessible to all candidates.

Topics which were answered well included performing a simple calculation, describing insect pollination, and the identification of xylem. In a number of instances, marks were lost as a result of candidates failing to read the question carefully and select appropriate information for their answers. This seems to be a common difficulty and has been commented upon in previous reports.

Question 1

The majority of candidates were able to name antibodies correctly, but the other answers were more variable. Many candidates correctly named eosinophils as granulocytes, but the spelling of this term was very erratic. However, as a general principle, Examiners give candidates credit for incorrect spelling provided that the word is recognisable and unambiguous.

Question 2

In (a), many candidates correctly named the cells as erythrocyte (or red blood cell) and epithelial cell (or an equivalent term, such as pneumocyte), but some candidates named structures other than cells. Part (b) proved to be quite discriminating, partly because candidates tended to give descriptions of the structure of alveoli, but did not explain how their structure is related to the function of respiratory gas exchange. There were some very good, detailed answers which referred to the total surface area of the alveoli, their thin walls and the presence of capillaries, and related these to their effects on diffusion and the transport of respiratory gases maintaining the diffusion gradient for oxygen and carbon dioxide. Whilst a number of candidates correctly referred to the presence of a surfactant, it was clear that some candidates believe incorrectly that the presence of moisture in alveoli increases the rate of diffusion. In (c), although there were some rather strange calculations, the majority of candidates used the information provided to calculate the pulmonary ventilation rate correctly.

Question 3

The answers to (a) proved to be surprisingly variable. Common errors included naming maltase in the first box, and giving glucose only as a product of the digestion of lactose. Part (b) proved to be more challenging. The majority of candidates referred to active transport in (i), and there were some accurate references to sodium-glucose cotransport in (ii). However, relatively few candidates were able to make a suitable suggestion for (iii) and there were many incorrect references to the structure of fructose. Nevertheless, some candidates thought carefully about this and suggested that if glucose is absorbed actively, then it is possible that fructose is absorbed passively, by diffusion or by facilitated diffusion. Some candidates also referred correctly to a possible difference in the number of membrane transporter proteins for glucose and fructose.

Question 4

In (a), the majority of candidates correctly named the aorta (or aortic arch) but the part labelled **B** was less frequently named correctly. In (b), there were some good, detailed descriptions of coronary circulation, with appropriate references to the coronary arteries, capillaries within heart muscle and to the transport of oxygen. However, there were also several of irrelevant descriptions of pulmonary circulation. In (c), some candidates simply repeated the stem of the question and described the cardiac cycle, without explaining how the sequence is coordinated. Candidates who described the conducting system of the heart readily gained full marks here with good descriptions of the roles of the SA node, the AV node and the Purkyne fibres. In (d), some candidates were able to give good physiological explanations of the effect of exercise on blood flow to muscles, usually with references to increased oxygen demand, increased production of carbon dioxide and an increase in heart rate. References to adrenaline and vasodilatation were also given credit. However, there was a tendency for some candidates to digress into descriptions of the effect of exercise on breathing rate, which was not relevant in this instance.

Question 5

In (a)(i), there were some good descriptions of adaptations, including references to the presence of haemoglobin, gills and a siphon. One weakness in the answers to this question was the lack of appropriate vocabulary by some candidates, who were able to express the general idea, but in rather vague terms. As an example, 'rat-tailed maggots have a tail to obtain air from the surface of the water' could be expressed more accurately. Part (a)(ii) yielded a wide range of answers, from those which repeated information from (i), to those giving good descriptions of, for example, the shape of the invertebrate in relation to reducing drag, or the presence of claws to hold on to the substrate and to prevent the invertebrate from being washed away. The majority of candidates were able to gain at least one mark in (b), for a reference to the inverse relationship between temperature and the concentration of dissolved oxygen. Better candidates supported their description with a suitable quantitative reference.

Question 6

Nearly all candidates gained marks in (a) for their descriptions of adaptations to insect pollination. Part (b), however, proved to be more discriminating as relatively few candidates gained full marks. Whilst many candidates recognised that the growth rate of the pollen tube increases up to 90 minutes and decreases thereafter, relatively few referred to the peak at 90 minutes, or substantiated their answer with a correct quantitative comment. Some candidates seemed to misread the figures and referred to a maximum growth rate at 120 minutes, others attempted to manipulate the figures, but made careless errors with subtraction.

Question 7

The majority of candidates identified xylem correctly in (a), but the answers to (b) were more variable. There were some very good, detailed and accurate descriptions of the role of the endodermis, with references to the Casparian strip, suberin, the apoplast pathway and the symplast pathway, for which candidates readily gained full marks. Perhaps inevitably, there was some confusion between the endodermis and the epidermis and, consequently, there were some irrelevant accounts of the uptake of water by roots, or of transpiration in leaves. In (c)(i), many candidates recognised the direct relationship between temperature and the concentration of potassium in the root cells and, again, some candidates qualified their description with an appropriate quantitative comment. Part (c)(ii) proved to be demanding for candidates and relatively few gained full marks here. Although there were many correct references to active uptake, few candidates synthesised all the information in this part of the question and did not refer to the initial concentration of potassium ions in the external solution. Some candidates clearly did not appreciate the context of this investigation, and digressed into details of stomatal mechanisms and transpiration.

Question 8

The answers to (a) were rather variable, but many candidates were able to give the correct sequence of letters here. Part (b) was straightforward, although a number of candidates indicated incorrectly that both cells are haploid. In (c), there were some very confused accounts of oogenesis, or irrelevant accounts of the menstrual cycle, or spermatogenesis and fertilisation. Some of the accounts started incorrectly, but candidates were given credit, where possible, for the subsequent stages. Nevertheless, there were also some very good, detailed accounts which not only named the cells in the correct sequence, but also correctly named the type of nuclear division which was responsible for the formation of the primary oocyte, secondary oocyte and the ovum.

6112 Unit 2H**Examiners' Report**

Maximum mark..... 60

Mean mark 34.0

Standard deviation 9.5

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

In general, trench foot was answered much better than frostbite. The responses to frostbite were much vaguer with just reference to 'being cold and this caused feet to be needed to be amputated'. Also, in both cases the feet were mentioned, but without the specific reference to 'tissue damage'. Part (b) was answered well with the majority of candidates picking up full marks, usually for the change in temperature seen and a calculation of by how much. Very rarely were explanations given, but when they were, they were clear and well presented.

Question 6

Responses to (a) were disappointing, many candidates just referring to 'colostrum providing much needed nutrients to help the baby grow properly'. When antibodies were given, the explanations usually referred to 'antibodies helping the baby's immune system', rather than citing passive immunity. Part (b) was done well with most candidates being able to compare the lactose and protein contents of the milk. Marks were sometimes lost here for just quoting figures and not making a comparison. In (b)(ii), many were able to pick out the advantages of cows' milk and explain them clearly. Others lost marks by not just sticking to comparing cows' and human milk, but also by trying to compare with colostrum.

Question 7

The altitude question this year was answered much better than in previous years. 'Partial pressures of oxygen' were quoted rather than 'oxygen concentrations' and references to the 'thinness of the air'. In (a)(i), many lost a mark for just quoting figures and not doing a simple calculation. In (a)(ii), reference to low partial pressures was often awarded, but then further explanations did little more than repeat the stem 'so lose consciousness at high altitudes'. Very few references to hypoxia were seen. Some highly imaginative factors were manipulated to fit (a)(iii) but others failed to take account of the 'increase' at high altitudes. Part (b) was also pleasing with fewer references to woolly hats and thick jumpers and more 'increased red blood cells so increased haemoglobin concentration'. Also many candidates correctly described barrel chested and made references to height differences.

Question 8

Common with 6102

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

Maximum mark.....	32
Mean mark	21.2
Standard deviation	4.7

General comments

Overall the standard of coursework at AS level improved once more continuing the consistent gains shown recently. The improvement in the January series arose from the use of separate headings when tackling sub-sections within each criterion. Nevertheless the quality of evaluation was still marred by weaknesses in sub-section (a), where many candidates failed to comprehend the requirements regarding variability and reliability. The usual investigations on enzymes - about optima and the effects of substrate concentration on their activity - predominated. There were very few unusual studies, which contrasts with the approach taken by a number of Centres in June 2007.

Centres' scores either closely matched those of the Moderators or differed very widely. Centres that annotated scripts generally received moderated marks close to the original scores, but others who awarded almost intuitive values to candidates' work quite seriously over-estimated their quality. Annotations and marks for sub-sections within the body of candidates' work are essential supports during the moderation process. The task of a Moderator is to check the validity of Centres' sub-section scores; it is not to re-mark the work itself. As in the summer, some Centres used intermediate marks for sub-sections. This is not recommended; it is best to stick with scores at particular levels for any one criterion and then make a judgement as to whether an intermediate mark is justified.

There were relatively few problems with administration. However, Moderators are concerned about the approaches taken by some Centres to re-submissions of coursework and to the transfer of marks. Hopefully the following will clarify these issues. Where candidates entered in a previous series and make no changes to their work in a current one, then they have taken the 'Transfer route'. Their marks (the moderated marks) will be transferred from the previous series. These candidates will be labelled T on the OPTEMS. It is not permissible to re-enter them with their original centre marks in a new sample. Centres may re-enter candidates for re-moderation, but only if they have made substantial changes to their work. Changes must be detailed on the Record Cards. These are expected to be substantial and ideally will include new data.

Very few Centres 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*.

Pocket files featured in the January series. Centres are urged to use treasury tags.

Whilst many previous reports have 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 to provide headings for sub-sections, which assist them in their attempts to fulfil criteria to a high level, which is beneficial.

Planning was approached in a very formulaic way. This perhaps reflected the nature of the investigations seen in January, which were essentially class experiments. Consequently hypotheses were those of a textbook type, with biological support that was too general to be of much worth. For example, one candidate wrote 'catalase has an optimum rate of reaction at pH 7' and then proceeded to justify this from the point of human physiology, yet extracted the enzyme from potato.

Biological support requires careful thought if it is to reach higher marks. It needs to be relevant. This standard is hardly ever met by the rigid employment of class notes, textbook, and / or downloaded information *per se*.

Controls were often listed, but there was often little specificity about the process of control itself.

A number of Centres awarded 8 marks for anything written on safety. For 8 marks, safety must address the hazards of the equipment and of the specific chemicals employed as well as the precautions taken to minimise risk.

Implementing

As in the June series, Moderators often lacked assistance because Centres failed to record their marks for (a) and (b). Quite frequently, inappropriate overall scores were recorded when the method employed lacked precision. A typical example was an approximate measurement of gas evolved to the nearest cm^3 . Equally, if measuring instruments are not very precise, candidates will not gain high marks by providing data that suggest otherwise. Moderators changed marks where serious errors occurred in tables. Frequent amongst these included inadequate headings, unspecified quantities, units in the cells of tables and inconsistencies. In addition, it is expected that candidates attempt to assemble all raw data as a single table.

Moderators need to see evidence of considerable data collection for the award of higher marks. 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.

Analysis

Drawing graphs does not present a problem for most candidates. However, being selective and / or drawing the most appropriate graph is a very real problem for many. Candidates frequently confuse the time taken for a reaction with reaction rate. Many also calculate standard deviation and / or standard error from inadequate data.

As in the summer, most difficulties were 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. Very few Moderators saw candidates who explored E (a). However, those candidates who gave this sub-section some thought were well rewarded by doing so. Many Centres awarded high marks overall for this criterion, where there was only passing evidence of E (a).

As in the summer, Moderators expressed concern at 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.

6103/03 Unit 3 Paper 3**Examiners' Report**

Maximum mark..... 38

Mean mark 19.5

Standard deviation 6.0

General comments

The Examiners were pleased to see that most candidates were able to make some attempt at all sections of the paper. In most questions, candidates seemed to understand the type of answer that was required. However, it was noticeable on some of the sections where reference to data was required that a significant number of candidates did not relate their answer to the correct data. There was no evidence that the paper could not be answered in the time allowed.

Question 1

In (a), many candidates were able to give clear descriptions of similarities and differences between the organisms. There was a noticeable confusion of the terms saprobiontic, heterotrophic and parasitic. Common errors included reference to *Rhizopus* feeding on a dead host and confusion of *Rhizopus* with *Rhizobium*. In (b), most candidates realised that the damage to the leaf tissue would reduce the ability of the plant to perform photosynthesis. Some candidates described damage to the potato itself.

Question 2

In (a), almost all candidates were able to name a suitable organism. Many candidates also linked the production of carbon dioxide with the respiration of these organisms. Common errors included references to the respiration of cows and naming humans as the organism burning the faeces. In (b), better candidates described how the respiration of the plants used up some organic material to release energy. Common errors included reference to carbon dioxide or energy being used for respiration, reference to respiration in higher trophic levels and organic material being used in photosynthesis. Part (c) was generally answered well. In (d), most candidates performed the correct calculation. A large number of candidates did not give an answer to one decimal place, as indicated by the data in the table. The units were omitted in many answers. A noticeable number of candidates did not attempt any calculation. Part (e) was generally answered well. Some candidates referred to higher levels of industrialisation or fossil fuel use in the USA but did not indicate that this might lead to higher levels of carbon dioxide. Many candidates referred vaguely to light, but without any qualification such as day length or intensity. In (f), there were many very good descriptions that gained full credit. It was pleasing that many candidates referred to the enhanced greenhouse effect and described the effect of the greenhouse gases in the upper atmosphere. Some candidates referred vaguely to the sun's rays or light. Many candidates stated that less photosynthesis would lead to an increase in carbon dioxide levels without any reference to continuing respiration or combustion. Ozone was included in a large number of answers.

Question 3

In (a)(i), relatively few candidates gained both marks. Most candidates referred to plants or photosynthesis, but did not relate the idea of GPP being specifically the total biomass produced or total energy taken in. Many candidates referred to energy being produced by photosynthesis. Candidates who quoted equations without any qualification did not gain any credit. In (a)(ii), most candidates were able to give two acceptable factors. As in Question 2(e), vague references to light did not gain any credit. Some candidates gave biotic factors. Part (b) was generally answered well. The most common omission was to refer to respiration without any indication that it would need to be aerobic to use up the oxygen. Part (c)(i) was generally answered well. Common errors included not referring to the changes as distance increased, confusing the two seasons and stating that there was no increase in the summer, or that it stayed constant. Part (c)(ii) was disappointing. Some candidates realised that the movement of the water would tend to wash dead material downriver. Relatively few candidates were able to relate the increased community respiration in winter with an increase in bacterial activity as more detritus might be available as leaves are shed, or algae die down. In (d)(i), most candidates referred to the increase in GPP in the river. Many candidates gained credit for the idea of more food being available for the trout. There were very few candidates that linked the high GPP with a high population of algae and the effect on the food chain up to carnivorous fish. A large number of candidates stated that the fish fed on the algae. In 3(d)(ii), relatively few candidates realised that the increased community respiration would lead to a lack of oxygen. Many candidates stated that the increased community respiration indicated that there were more fish. As in 3(d)(i), candidates referred to algae as the food of the carnivorous fish. A surprising number of candidates used the incorrect data for their answers and referred to changes in GPP.

6104 Unit 4 Core

Examiners' Report

	Core information for:		
	Option A	Option B	Option C
Maximum mark	40	40	40
Mean mark.....	19.8	19.1	18.9
Standard deviation.....	6.7	7.2	6.9

Question 1

In (a), the usual confusion between the cerebellum and the cerebrum was seen. In (b), marks were lost through poor expression. A number of candidates simply wrote 'voluntary muscle action' for mark point 4, failing to state that the cerebral hemispheres controlled these actions. For mark point 1, a lot of candidates stated that the cerebral hemispheres 'detected' the stimuli. There was some confusion with the roles of the cerebellum.

Question 2

Part (a) caused problems for all but the very best candidates. Very few candidates could describe the term 'negative feedback' succinctly and there were many descriptions of homeostasis instead. The information in the diagram was frequently reworded in answers and not actually interpreted to illustrate negative feedback. Many of those candidates who did try and apply the information seemed to think that just the presence of cortisol triggered the subsequent effects on the hypothalamus and pituitary gland. Candidates clearly do not understand the concept of removal of inhibition if cortisol levels decrease (alternative converse mark scheme). In (b), a high proportion of candidates could not correctly name a hormone secreted by the anterior pituitary gland. The Examiners expected to see ADH, but a significant number of candidates thought that this was where adrenaline was produced. Although we did accept abbreviations, very few candidates actually named the hormones fully. The third part to this question was well answered on the whole, although many answers were clumsy. For example, 'hormonal control is carried in the blood stream'.

Question 3

Part (a) scored well. The calculation in (b)(iii) caused problems for even the better candidates. Many candidates did not choose the correct values from the graph, a high proportion thought that there were 100 milliseconds in a second, and only a few applied the calculation to the question and truncated their answer down to the nearest whole number. The responses in (c) were variable. A large proportion of candidates appreciated that GABA would cause the inside of the membrane to become more polarised, but many thought that this would inhibit an action potential from being caused completely. A number did give mark point 3, however, mark point 2 was rarely seen.

Question 4

In (a), there was evidence that a reasonable number of candidates appreciated the significance of ethanal being reduced to ethanol, although there was the usual confusion over which molecule was being oxidised and which was being reduced. A number of these candidates also lost out on mark point 3 as their answers were too vague by stating that 'respiration' would not be able to continue. Some candidates thought that ATP was made during the conversion. However, there were quite a few candidates who totally missed the point and wrote that the ethanal was too toxic for the yeast cells and, therefore, had to be converted into less toxic ethanol. And of course there was the odd candidate who suggested it was essential to make the beer alcoholic! Parts (b)(i) and (b)(ii) caused problems to those candidates who failed to heed their teacher's advice on exam technique. A number of candidates failed to read the question properly and talked about the change in light transmission and not the rate of respiration, whereas others lost marks by not stating the time interval to which their description referred. There were problems in understanding the graph, with some candidates thinking that the rate was increasing, or that the straight diagonal line represented an increase in rate and the horizontal line represented a constant rate of respiration. Similarly, in (b)(ii), there were candidates who thought that the rate of sucrose respiration was decreasing at a constant rate, or was constantly decreasing. Candidates who understood the question and had performed the practical, understood the need for covering the test tubes in (b)(iii), but a high proportion of candidates thought that the tubes were covered to prevent contamination by microorganisms from the air, or to prevent evaporation of water out of the tube. Some candidates, who did know that the tubes were covered to prevent oxygen entering, indicated that the reason for this was entirely to ensure that the yeast cells were respiring anaerobically. In (b)(iv), the majority of candidates knew that the tubes were placed in a waterbath to keep the temperature constant, but could not go on to explain why.

Question 5

Part (a) was extremely well done. Clearly, many teachers had used previous mark schemes to summarise this topic with their students. Some candidates were unclear as to the relative positions of the capillary wall, the basement membrane and the podocytes. Part (b), however, was not answered as well. Vague answers were seen, such as 'the useful molecules e.g. glucose and water return back to the blood by diffusion and active transport'. The stronger candidates did score full marks however, with very detailed descriptions of the sodium cotransport mechanism.

6104/01 Unit 4 Option A**Examiners' Report**

	Option only	Core + Option
Maximum mark.....	30	70
Mean mark	13.5	33.3
Standard deviation	4.8	10.5

Question 6

This was generally a high scoring question. There were still some candidates who made reference to the HIV's nucleic acid type as 'RNA retrovirus' or 'RNA reverse transcriptase'.

Question 7

In (a), many candidates lost marks as they were not making significant comparisons of the number of cases caused by the two bacteria. A reasonable proportion of candidates just described the cases for *Salmonella* and then for *Staphylococcus* and there were those who compared numbers of cases for every year, failing to pick out the changes in trends. Very few candidates actually carried out any calculations to quantify their data, still just quoting figures instead. Although we have asked about endotoxins and exotoxins on several occasions over the years, candidates still have problems in expressing themselves accurately. The usual incorrect answers were seen in (b): there is a delay in symptoms occurring instead of a delay in release of endotoxin, exotoxin is a Gram negative bacteria and endotoxin is a Gram positive bacteria, large amounts of endotoxin are needed to cause infection instead of effect or symptoms, endotoxins are released by Gram positive bacteria and exotoxins by Gram negative bacteria (instead of both types of bacteria).

Question 8

In (a), there were a number of candidates who simply described the data, failing to appreciate that we wanted them to explain the results. Those who did attempt an explanation frequently talked about the lipopolysaccharide layer preventing the ampicillin from reaching the cell wall of the *E. coli*. Full marks were only gained by the better candidates. In (b), a lot of candidates knew that overuse or misuse of antibiotics had something to do with the spread of resistance, but thought that this was through causing a mutation and not by selection of the more resistant bacteria. The word 'immune' was still creeping in to some candidates' answers, instead of resistance. Part (c) caused problems as candidates had difficulty in selecting the appropriate figures to use in the calculation. A number of candidates made reasonable suggestions in (d), provided that they had read the question carefully and not suggested how the 'production' of the enzyme had been prevented. There were a number of answers that stated that the component S coated the antibiotic protecting it from enzyme degradation.

Question 9

Despite a very similar question recently, (a)(i) was poorly done with many candidates comparing the number of colonies of each bacteria at each pH. There were also poorly worded answers, where pH was described as letting the bacteria 'work' well or badly. Candidates are failing to read the question properly to identify the key words and to answer the question in the terms actually used in the question. In (a)(ii), candidates failed to talk about the 'adaptation' of the bacteria to the pH of their environment. Many candidates wrote their description (asked for in part (a)(i)) as their answer to (a)(ii). Again in (b), candidates were failing to read the question carefully enough to identify what they were being asked. Many candidates did not state what the effect would be on the 'number of colonies counted' had their precaution not been taken, or else gave vague answers such as 'the results would be inaccurate or unrepresentative'. A number of candidates described the control of variables instead of actual precautions.

6104/02 Unit 4 Option B**Examiners' Report**

	Option only	Core + Option
Maximum mark.....	30	70
Mean mark	15.6	34.7
Standard deviation	5.1	11.5

General comments

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

Question 6

Candidates were often able to state that glucose isomerase was used to produce fructose, but few could give any correct facts about amyloglucosidase. More gained marks for details about lactase, with the majority knowing that it was used in the production of lactose reduced milk.

Question 7

In (a), the majority gained two marks with statements about the age ranges when diabetes was more common in women and when it was more common in men. Many attempted to manipulate the data, but a significant number were unable to perform this task accurately. In (b), many candidates gained both marks, but vague statements about a poor diet or unhealthy diet were also seen frequently.

Question 8

The topic of soy sauce production has not been examined for some time and many candidates seemed unfamiliar with the process. In (a), few could give a valid reason for adding wheat while a worrying number included enzymes as a microorganism in (b). In (c), a lack of clarity in poorly expressed answers often let candidates down, but many could name a product of fermentation for one mark. A significant number also referred to a lowering of the pH. The calculation in (d)(i) required a simple subtraction, which many candidates could do, but few were able to get the second mark for calculating the percentage increase. The most common error was to divide by 0.73, rather than by 0.07.

Question 9

There were some good answers to (a)(i) and it was pleasing to see that more answers were written in a comparative style than has been the case in previous years. Commonly awarded marks were for stating that there was a faster loss of vitamin C at room temperature and for comparing the vitamin C content after 7 days and after 20 days. In (a)(ii), relatively few gave valid statements apart from referring to the fact that vegetables should be chilled. It was disappointing in (b) that many candidates seemed to lack experience of practical work. Yet again the practical based question on this option proved to be the most difficult for candidates. Very few candidates could describe a correct colour change. There were many good answers in (c), where a mark was commonly awarded for candidates knowing that ascorbic acid is an antioxidant. Several candidates were also able to state that it prevented rancidity and could give some detail of the mechanism. However, weaker candidates either gave a vague statement about ascorbic acid being a preservative, or they gave answers that related to a different part of the specification and referred to scurvy and collagen synthesis.

6104/03 Unit 4 Option C**Examiners' Report**

	Option only	Core + Option
Maximum mark.....	30	70
Mean mark	14.4	33.4
Standard deviation	3.9	9.8

General comments

Questions 1, 2, 3, 4 and 5 on this Paper were common between all option papers. There was little difference between the standard of the answers to these questions compared with the other two options.

Questions 1 to 5

Core question common to 6104/01 and 6104/02.

Question 6

This question was answered poorly by a large number of candidates. Although the specification clearly states that candidates are required to recall the roles of leucocytes and understand the roles of lymphocytes, few candidates demonstrated either of these abilities well. Answers on the whole were too vague. Under the roles for B-lymphocytes, the most common answer seemed to be 'secretes antibodies' with no reference to plasma cells. Similarly, with T-lymphocytes functions of specific cells were given without giving the name of the type of cell responsible for that function. Macrophages were better answered in general, but again many candidates referred to the 'phagocytosis of antigens' rather than the whole bacterium.

Question 7

A well answered question with many candidates gaining four or five marks. In (a), it was rare that all three marks were not attained. Some candidates very succinctly said 'all three features of the left ventricle were least in the untrained individual compared with the runner and the wrestler' which earned them a well deserved three marks. The most common reasons for dropping marks were: purely quoting figures and not making a comparison and forgetting that the features needed to be compared to the untrained individual and by saying that 'the runner had the greater volume out of the three' - this earned no marks. Responses to (b) were more varied. It was clear that many candidates have a good knowledge of the heart but many thought that the heart was composed of muscle only. A mark could be obtained for reference to cardiac muscle, but it had to have been a general point and not related to an incorrect layer. As an example, 'the three layers are the pericardium, the myocardium and the endocardium and they consist of cardiac muscle' would not have earned the second mark.

Question 8

The calculation in (b) was either really well done or barely attempted. Some candidates also lost a mark for failing to convert from cm^3 to dm^3 . Part (c) caused problems for many candidates. Often the explanations were correct, but the changes to pressures were incorrect: 'stroke volume increase after the training programme so as a result systolic pressure decreases as heart rate drops'. Also many correctly identified that diastolic pressure would decrease, but few were able to give an explanation other than 'greater venous return'. There were, however, some well thought out and logically presented answers which rightfully scored full marks.

Question 9

The photograph in (a) caused much confusion, with B and C being identified as 'mitochondria'. Many also identified B as a capillary when it was clear that the wall was of far greater thickness than the alveoli, structure A. Again it appeared that this had been an area of the specification that had been overlooked. Part (b) overall was done much better with many candidates attaining full marks on each section. Part (b)(i) required comparisons of like time periods for men and women and not separate accounts of each linked with a 'whereas'. It was the lack of comparative statements where most candidates lost marks. The scale was misread by some candidates, so units were quoted in 100,000s. Part (b)(ii), again, was answered well with reasons well presented but again some candidates lost out on marks due to vagueness 'men went out to work where it was smoky' with no reference to possible constituents of the smoke. Marks were also lost for incorrectly identifying that 'women did not start smoking until the 1960s' and this resulted in an immediate increase in deaths.

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 2008 can be found on the next page.

Unit grade boundaries

Unit	Maximum mark	Grade				
		A	B	C	D	E
	<i>Uniform marks</i> 100	80	70	60	50	40
	<i>Raw marks</i>					
6101 Unit 1	60	44	39	34	30	26
6102 Unit 2B	60	44	40	36	32	28
6112 Unit 2H	60	45	41	37	33	29
6103 Unit 3	70	51	45	39	33	28
	<i>Paper 01 T1</i>	32	26	22	18	12
	<i>Paper 03</i>	38	25	22	20	16
6103 Unit 3 (International option)	70	47	42	37	33	29
	<i>Paper 02 W1</i> <i>International only</i>	32	22	19	17	13
	<i>Paper 03</i>	38	25	22	20	16
6104 Unit 4 Option A	70	44	39	35	31	27
6104 Unit 4 Option B	70	48	43	38	33	29
6104 Unit 4 Option C	70	44	39	35	31	27
6105 Unit 5B	70	50	45	40	35	30
6106 Unit 6 (Option 1)	70					
	<i>Paper 01 T2</i>	32				
	<i>Paper 03</i>	38				
6106 Unit 6 (Option 2)	70	49	43	37	32	27
	<i>Paper 02 W2</i>	32	24	20	17	11
	<i>Paper 03</i>	38	25	22	20	16

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 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
Unit 1	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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