

# Examiners' Report January 2008

GCE

GCE SNAB Biology (8048/9048)

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Maximum mark..... 60

Mean mark ..... 28.1

Standard deviation ..... 8.4

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### General comments

This examination required candidates to apply their knowledge of the specification in a variety of contexts, some of which were unfamiliar. Some candidates were hindered in this exam with a lack of accurate knowledge. Other candidates knew examples from the course well, but did not show a deep enough understanding of the principles and concepts covered to be able to apply them in an unfamiliar context. This was sometimes combined with limitations in the candidates' scientific literacy skills as they either did not read and interpret the questions carefully, or expressed themselves in vague terms which were open to misinterpretation and, therefore, failed to gain credit for some questions. The specification also assumes that candidates have knowledge of GCSE Science and an understanding of practical techniques, particularly in the contexts of the core practical outlined in the specification. These factors combined have reduced the mean mark for the exam significantly and fewer candidates have scored high marks on this paper. However, there is no evidence that candidates struggled to complete the exam in the time limit and many candidates did reveal a detailed knowledge of several areas of the specification.

Teachers are advised to help candidates to fill gaps in their knowledge and check their understanding of the principles and concepts covered in the specification, including practical skills, rather than just concentrating on the recall of factual knowledge of the course materials. Careful coaching to help candidates interpret the demands of different types of question, for example the difference between describe and explain, will also help many candidates.

### Question 1

This question set out to test candidates' knowledge and understanding of transport processes, together with their ability to carry out calculations, spot trends in data and evaluate evidence in the context of one of the core practicals from Unit 1.

Few candidates had difficulty with diffusion in (a)(ii), but mass transport, osmosis and active transport caused some candidates difficulties. In (b)(i), very few candidates seemed to have any difficulty with the calculation. Most candidates completed the calculation in (b)(ii) successfully, but a surprising number failed to calculate 200 correctly. Many came up with figures that, if considered carefully, the candidate would have realised were highly improbable (anything from 15 to 760!). A few candidates chose to ignore the repeated stress that the number of heart beats in **ten seconds** were counted and expressed their answer as 200 beats per minute. In (b)(iii), there was evidence that some candidates had not done this core practical, designed to illustrate many points about experimental design and data evaluation that are examined in the Practical Review paper (unit 3). Better answers were provided by candidates who had obviously had experience of the core practical.

Many candidates failed to grasp the concept of a prediction made on available data and the problems associated with extrapolation. Few considered the effects of the environment and the need to control variables. Many did gain marks for pointing out that different *Daphnia* were used, that only 3 were used, that there were few readings on which to base a prediction and that the *Daphnia* could respond much differently to a higher concentration of caffeine, even dying. Some candidates lost marks for covering the same point two or three times rather than providing alternative suggestions e.g. difference in age, gender and size of *Daphnia* only scored one mark, not three.

### Question 2

This question demanded that candidates apply their knowledge and understanding of enzyme action in an unfamiliar context. The inclusion of enzyme theory as a distinct topic came in as a change in the specification when it moved from the pilot to full national version. Previously, aspects of enzymes were scattered through several topics. The successive parts of this question explore enzyme theory more narrowly, but more deeply, than has been the case in previous 6131 examinations. A few candidates were thrown by the context of the question and did not attempt several parts of the question.

In (a)(i), many candidates had confusions between the waxy lipid layer and a phospholipid bilayer leading to poor responses. Some described the waxy layer as water repellent rather than waterproof or hydrophobic. Many candidates gained credit for recognising that pectinase is specific and would not be able to digest the lipid surface. Others recognised that the waxy layer would prevent the enzyme reaching the pectin; unfortunately several candidates lost marks here by expressing it in vague terms such as the enzyme could not reach the orange or orange peel. In (a)(ii), most candidates demonstrated a good knowledge of enzyme specificity although some did not mention the significance of the shape of the enzyme's active site. A few candidates still think that the active site is part of the substrate rather than the enzyme. Many candidates gained a mark in (b)(i) for appreciating that cutting would increase the surface area and, therefore, increase the rate of reaction; however, only a small number of candidates could correctly describe that this increased the probability of substrate-enzyme collisions. In (b)(ii), several candidates successfully made the link between hydrolysis and loss of water from the solution, others also came up with evaporation or the release of pectinase naturally found in the orange's cells. The more astute candidates also went on to describe how the pectinase itself was unaffected. However, an alarming number thought that pectin was converted into pectinase by the enzyme. A common error was in thinking that any pectinase involved in enzyme-substrate complexes was not in solution, but joined the solution once all the substrate had been broken down. A worrying finding was that many candidates did not clearly understand what is measured by concentration and considered it to be a ratio between the substrate and the enzyme rather than the number of enzymes per volume of solvent.

### Question 3

In (a)(i), a few candidates had difficulties identifying the source of the molecules from the diet. A few got them muddled up or thought that water and minerals were a good source of lipids or disaccharides. Others named the molecules rather than carrying out the question's instructions, despite them being highlighted in bold type. Few candidates struggled with the calculation in (a)(ii). The most common error was that candidates did not realise that the values in the table were for mass of nutrient per 100g of milk and hence not multiplying the difference by eight or multiplying by 800. Most candidates successfully answered (b), although some listed all differences and provided no explanation as to why the differences would cause an increase in weight. Some candidates misinterpreted the question by taking "put on weight" to mean "getting fat".

This interpretation may have had more of a distracting effect on candidates whose relationship with body mass and food tends to predispose them to view an increase in weight as a negative situation! The concept of babies needing to gain mass appeared to be disregarded. The other distracting factor was that candidates have taken on the message that breast milk is better than formula milk and, therefore, tried to manipulate their answers round to supporting this conclusion. Having read the question from one of these points of view, many then wrote responses concerning the relative effects of the two types of milk on deposition of fat. There were also many biochemical inaccuracies, such as statements that protein is made of fat, or that breast milk contains unsaturated fats, whilst formula milk, because it is from cows, contains saturated fats. As a consequence, far too many candidates overlooked the straightforward answer that protein is needed for growth, something that they should have been taught long before embarking on an A level course. The most common error in (c) was to include weight instead of mass for the calculation of BMI. Some candidates got the formula the wrong way round or missed the need to square the height. Many candidates were able to recall that a BMI of over 30 is classified as obese.

#### Question 4

Many candidates demonstrated a very good level knowledge of DNA replication and protein synthesis. However, some candidates struggled to answer the questions asked and just wrote down anything they could recall.

The most common errors in (a) were naming the sugars or whole nucleotides rather than the nitrogenous bases. In (b), most candidates drew two hybrid strands but some did not think through the doubling that takes place through replication so did not draw eight double strands. DNA polymerase was the most common correct answer in (c); restriction enzymes and ribosomes were common errors. Part (d) was a good example of where many candidates did not fully read the question and just wrote about what they had revised. Many candidates just wrote about the effects of mutated genes on the production of sticky mucus in CF sufferers regardless, having read the words "cystic fibrosis" in the stem of the question. Some candidates wrote all they knew about protein synthesis and barely considered the effects of mutations. Some candidates were confused with regard to the difference between sequences of bases in DNA and RNA, and sequences of amino acids in protein molecules. There were references to amino bases, genes being made of amino acids and amino acids being produced by the genes. There were some very good answers from more able candidates who appreciated the impact of changes in base sequence in DNA on protein synthesis and who were able to describe the effects at each stage from transcription to translation and onto the interactions between R groups and bonding.

#### Question 5

This was often the highest scoring question as many candidates were comfortable with the recall of information about the heart. However, some areas of misunderstanding were revealed in parts of the question that demanded explanation rather than just recall.

There was good recall of names in (a)(i). The most common error was recognising the wrong side of the heart, thus giving pulmonary artery instead of aorta for X, and right ventricle for Y. Several candidates thought that Z were Purkinje fibres, recalling diagrams from the control of the cardiac cycle rather than acknowledging that the picture was the external view of the heart. Other candidates assumed that Y was the atrium and Z the ventricle because they are used to labelling diagrams of the heart with that information. Few candidates made errors in (a)(ii). Those who did often ticked more than one box. In (a)(iii), nearly all candidates successfully recalled the name of the sinoatrial node, or SAN.

In (b)(i), many candidates were aware of the main stages of the cardiac cycle and the correct sequence. Those candidates that made mistakes tended to describe the full pathway of blood round the whole circulatory system rather than the sequence of events in the heart. In (b) (ii), most candidates recognised that the left ventricle has to pump blood further than the right ventricle, but failed to expand on the statement by recognising that the left ventricle has more muscle or has to divide blood between more capillaries. Some candidates wrongly described the left ventricle as having a larger volume, or having to pump more blood than the right ventricle. Other candidates provided a vague answer such as it having a thicker wall or that oxygenated blood requires greater pressure than deoxygenated blood. There were many weak responses to (b)(iii) - many as a result of failing to understand the question itself. Many seemed to think this was the same as (b)(ii) and just compared the left and right ventricles and limited their responses to "lower" and "higher" pressure descriptions, rather than considering the changes in pressure during the cardiac cycle. Many candidates appeared to have a poor understanding of the relationship between pressure and volume and regard changes in pressure as an ongoing sequence of events. Many just wrote that pressure was 'high' or 'low' without linking changes in the heart to *increasing* or *decreasing* pressure. The most frequent correct answer referred to blood pressure increasing during ventricular systole. Most candidates scored the mark in (c) for identifying two clear risk factors. Some candidates lost the mark by being vague over one of the two risk factors required such as just referring to poor diet or alcohol rather than clarifying the risk e.g. high saturated fat intake or high/excess alcohol consumption.

#### Question 6

This is an example of a question where many candidates did not answer the questions asked and assumed that the questions were asking them for the arrangement of phospholipids within a membrane.

In (a), many candidates were able to *describe* the fluid mosaic model, but few were able to explain why it was called 'fluid mosaic' apparently because they did not understand. Several candidates thought that the membrane is described as fluid because it contains water. Others used this question to write what they knew about movement across the membrane. Candidates who did gain marks tended to recognise that specific molecules were able to move within the membrane, rather than across it. In (b)(i), many candidates recognised the role of glycoproteins as receptors; however many thought that they were involved in energy storage, confusing them with glycogen. Many candidates scored one mark in (b)(ii) for mentioning phosphate in the head of the phospholipid, but tended to describe the properties of the phospholipids (hydrophobic/hydrophilic) and their arrangement within a membrane rather than their structure. Few candidates recalled the presence of glycerol. In (c), several candidates were unable to draw the cholesterol molecule correctly in the diagram. Some candidates surprisingly skipped this question, possibly because they did not read it fully and there was no line for them to write their answer on. Many candidates failed to draw the charged region of the cholesterol molecule in the hydrophilic region of the phospholipid bilayer, others failed to restrict its position to being contained within one of the two monolayers. In (d), lipoproteins were understood by the majority of candidates to refer to HDLs and LDLs. Many knew which ones were better for health, but fewer were able to explain why. Again many candidates had revised the sequence of events leading to atherosclerosis and wrote this out at length. Good candidates understood the differences and could describe the role of HDLs in transporting cholesterol to the liver to be broken down, as well as the binding of LDLs to receptors. Relatively few candidates knew the differences in density due to protein level and instead spent a lot of time focussing on the differences between saturated and non-saturated fatty acids. It was again apparent that many candidates failed to read the question carefully as they failed to respond to the request to explain how lipoproteins affected health.

Maximum mark..... 60

Mean mark ..... 33.9

Standard deviation ..... 9.1

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### General comments

There were more questions on this paper that required extended answers than has been the case in previous sessions and, although it is difficult to assess the effect of this, it may be that this has contributed to the slightly lower mean score. The impression is that weaker candidates found it more difficult to score all of the marks in questions aimed at lower grades, most often as a result of poor expression. This was particularly evident where the question required application rather than straightforward listing of recalled facts and some answers included repetition of the same point, or a copy of the question, presumably in an attempt to fill the space.

It should be noted that some questions are given more space: this is to ensure that even verbose candidates have room for answers and the script can be marked online. Many questions can be answered in much less space than is provided and candidates should be encouraged to find enough relevant points to match the mark allocation rather than use the number of lines as a precise guide. It was quite common for creditworthy work to be limited to the last two lines of a six line answer, following a restatement of the question or other unnecessary preamble. The candidates that tried to tell all they know, rather than answer the question, are more likely to have been particularly pushed for time with this paper.

There was, as has become usual, much to admire in the work of many candidates, particularly when handling unfamiliar material. It is very encouraging to see that candidates have a very clear understanding of processes such as photosynthesis, and also that they have the detailed knowledge to allow them to demonstrate their understanding. This has not always been so evident in the past.

### Question 1

Almost all candidates were able to score marks from this question. A significant number missed the focus on core temperature in (a) so lost marks by reference to peripheral receptors, but most knew that the hypothalamus is involved. A worrying number of answers described capillaries as being capable of vasodilation, or worse still moving closer to the surface of the skin. Many candidates knew that (b) involved fever, but marks were often lost by poor explanations of how it is brought about. Measuring core temperature as a means of estimating time of death is generally well understood and marks were mostly lost in (c) as a result of poor expression. For example some victims tragically died much sooner than expected.

## Question 2

Part (a) discriminated well, and is an example of how candidates can struggle when asked to compare. Some answers gave descriptions of mutation and crossing over which were correct but did not give a point of comparison and these often scored one mark unless they were very clear. Use of the terms 'allele' and 'gene' are generally poor with much confusion about the difference. Good answers, and there were an encouraging number, did give both sides of a comparison. Part (b)(i) was very unforgiving in that it was difficult to score without a very clear understanding of crossing over, although there were a few single marks that might have resulted from a guess. Part (b)(ii) was disappointing in the number of candidates that cannot have read the second paragraph of the stem since they gave only the details of the cross described in the first paragraph. These were able to score a maximum of three of the five marks available. More encouragingly, the crosses shown tended to be set out more clearly in the past, which made it much easier to award marks; but there remains much scope for improvement. Where examiners can identify groups of letters unambiguously as genotypes then credit will be given, but properly labelled diagrams remove all doubt and the use of the letters given is always a good idea. Part (c) scored well, with most candidates able to find at least two reasons for keeping animals in a zoo, although this was an example of the tendency to be repetitive in order to fill the space. Weaker candidates discussed the training of animals for release into the wild or made unqualified references to cruelty.

## Question 3

There was a surprising amount of confusion over quadrats in (a) with the majority of candidates thinking that it is a plastic or wooden square of some kind. Good candidates were able to discuss a defined area or sampling in some way, but only the best considered both. The question was really asking about the need for quadrat use so answers discussing the benefit of a grid were only given credit where some indication of a defined area was included. The value of a transect for a linear study was not understood at all well in (b), with the mention of systematic sampling being almost the only source of a mark, and that for relatively few candidates. Copying data from a table is very unlikely to be worth credit at this level, but many answers to (c) went no further than that. It is not the first time that the examiners have pointed out that a comparison requires at least two things to be compared, but some very long responses were worth no credit because not a single comparative term was included. The worst answers gave two separate lists describing the contents of each quadrat. Quoting values from a table will fare no better in general so candidates should be encouraged to manipulate figures in some way. A simple subtraction could have gained two marks here. Once again, there was often a lack of care in reading the question which led some candidates to describe everything between quadrats one and five: this rarely managed to gain marks. Succession seems generally well understood and most were able to give good responses to (d), although there were some odd descriptions of the way in which bare sand was responding to changing conditions.

## Question 4

There were many very pleasing responses to this question, and there was plenty of evidence that the processes involved are well understood. Apart from some confusion with hydrolysis, (a) was almost trivially easy and thankfully almost everyone was aware that photosynthesis requires light. The responses to (c) were some of the best on the paper, particularly in the way that candidates were able to focus on the question in discussing electrons, although there were examples of writing the whole story. Similarly, (d) provided many with full marks with the most common omission being the reduction of GP.

### **Question 5**

This proved to be the most demanding question on the paper, with weaker candidates finding it difficult to produce clear answers. Part (a) usually elicited good explanations of active immunity, although the use of space-filling statements seemed particularly prevalent here, and (b) showed that secondary responses are well understood. Part (c) resulted in some of the worst cases of long answers worth no credit. The information was often copied from the table without any attempt to explain its significance, despite the required responses being generally quite straightforward. There must be some comment over and above that in the table to earn a mark. In some cases a simple comparison will suffice, but some reference to the actual question would also be of benefit and might give some guidance as to how to use the information. Part (d) discriminated in favour of the best candidates, with full scores being quite uncommon. Only the best were able to appreciate the importance of the cell-mediated response in dealing with a viral infection or the benefit of two populations of lymphocytes being involved.

### **Question 6**

Very few candidates failed to recognise a genus for (a), although a few were not convinced that they were dealing with different species. Isolation was identified by the majority in (b), and most went on to give some description of the effects of different selection pressures on the resulting populations. The third mark was commonly lost by imprecise descriptions of how this could lead to differences, and although animals seeking an adaptation were less common than at times in the past, some familiar misunderstanding were in evidence, such as the different environments causing different mutations. Answers to (c) showed that candidates are generally familiar with the problems of coordinating international conservation projects.

## UNIT GRADE BOUNDARIES AND UNIFORM MARKS

The raw mark obtained in each unit 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 the AS examinations Units 1 and 3 have a weighting of 30% and Unit 2 has a weighting of 40%, and the maximum raw marks and maximum UMS marks are shown in the table below.

Unit code	Maximum raw marks	Maximum UMS marks
6131	60	90
6132	80	120
6133	40	90

For the A level, Units 1, 3, 4 and 6 have a weighting of 15% and Units 2 and 5 have a weighting of 20%, and the maximum raw marks and maximum UMS marks for the A2 units are shown below.

Unit code	Maximum raw marks	Maximum UMS marks
6134	60	90
6135	80	120
6136	60	90

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 of the unit, paper 01 (visit or issue report) and paper 02 (practical work review). These marks are then added together to find the A and E boundaries for the unit 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

Please refer to the notes above.

Unit	Maximum mark	Grade				
		A	B	C	D	E
	<i>Uniform marks</i>					
	90	72	63	54	45	36
	<i>Raw marks</i>					
6131 Unit SN1	60	37	33	29	26	23
6134 Unit SN4	60	43	39	35	31	27

### PROVISIONAL STATISTICS

The provisional percentages of candidates obtaining at least the indicated grade are given below.

Unit	Number sat	Cumulative percentage of candidates				
		A	B	C	D	E
6131 Unit SN1	5 763	17.4	29.7	46.4	59.6	72.9
6134 Unit SN4	2 902	20.4	35.1	50.9	66.4	78.9

AS cash in	Entry	A	B	C	D	E
8048	337	10.7	27.6	51.6	77.7	97.3
9048	16	6.3	37.5	68.8	87.5	100.0

## APPENDIX A

### 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 the module. Grade boundaries for units 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	UM	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 Salters-Nuffield Biology must take three units, Unit 1 and Unit 3 are weighted at 30% and Unit 2 is weighted at 40%

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

Table 2 - Advanced Level Subjects

Subject		Unit Weighting				
Grade	UM	15%	16 <sup>2</sup> / <sub>3</sub> %	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 Salters-Nuffield Biology must take six units, Units 1, 3, 4 and 6 are weighted at 15% and Units 2 and 5 are weighted at 20%. The candidate in this example has four units in the bank.

	Uniform Mark Obtained	Approximate level of performance
Unit 1	59	C
Unit 2	73	C
Unit 3	69	B
Unit 4	82	A
Unit 5	*	
Unit 6	*	
<b>Partial Total in Bank = 283</b>		

The candidate already has 283 uniform marks in the bank. If a Grade B is required in the subject, the candidate must obtain at least 137 marks from the remaining two (e.g. 70+67) in order to gain the minimum uniform mark of 420 for a Grade B (283 + 137 = 420).

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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