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Examiners' Report January 2009

GCE

GCE08 Biology (8BI01)

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Maximum mark 80

Mean mark 39.8

Standard deviation 11.8

General comments
It was pleasing to see a full range of marks from candidates, ranging from a high of 75 to a low of 3 marks. Although this paper mirrored exactly the number of marks and the timing allocation of the specimen paper, it was evident that some candidates had found timing a problem. The examiners are aware that time is tight on this paper, especially this January when the candidates were all Year 12 students taking the examination after one term's teaching. It had been hoped that the presence of multiple choice and other short-answer questions would enable to candidates to progress more quickly. The examiners appreciate that this effect was negated to some extent by the volume of reading involved and will attempt to address this in future question papers.

Question 1
This question scored highly, even in the weakest candidates.

Question 2
Candidates generally scored well in this question. A good understanding of the genetic code was demonstrated in (b). It is acknowledged that for a multiple choice–type question there was a lot of working out needed and that this was time-consuming for the candidates.

Question 3
The drawing of the formation of maltose in (a)(i) saw a range of responses. Some candidates scribbled down their diagram not appreciating the need for accuracy, whereas other candidates spent too much time on their diagrams, drawing the structures out neatly with a ruler. More able candidates would score all 3 marks whereas the weaker candidates would only get the mark for indicating the formation of water. Candidates need to know that they can be asked to draw out the structures of the molecules named in the specification. Although these diagrams need to be biochemically accurate in terms of the positioning of the H or OH groups, they can be sketched and don't need to have the quality of a computer print out. The structure of starch was generally well-described in (b), but only the more able candidates extended their account to describe why the structure made starch a suitable energy-storage molecule. Candidates need to understand that a question needs to be answered in its entirety in order to access full marks; in this case, the full four marks could not be awarded if the candidates had only described the structure of starch. A common error was to refer to energy and not glucose in marking points 4 and 6.

Question 4
Part (a) generally scored well - except for those candidates who used the expressions water-hating and water-loving. These are excellent *aides memoires* but do not score marks unsupported. Grade E candidates would generally comment on the polar heads and non-polar tails and the better candidates would then link these properties of the molecule to their orientation in the membrane. The rest of Question 4 was not so well done. Candidates need to learn the details of the core practical work highlighted in the specification for the unit exams, as well as the prescribed specification content. In addition, they need to **understand** the purpose of each individual practical; not only can questions ask about the practical work in quite fine detail but they may also require application of the principals of the practical work to novel situations.

In this particular question, very few candidates seemed to understand the significance of using beetroot for studying membrane permeability; they did not seem to realise that the pigment is contained within the vacuoles of the cell and therefore would only be able to leak out of the beetroot into the water if the integrity of the vacuole membrane and the cell membrane had been disrupted. The term osmosis is clearly mis-understood by a number of candidates as there were many responses referring to the pigment passing out of the beetroot by osmosis. Candidates also need to be more specific in the wording of their answers and avoid using imprecise expressions like 'amount', 'affected' and 'altered'. For example, in (b)(i) reference was made to the 'amount' of ethanol instead of its volume; in (c)(i) the ethanol concentration was described as 'affecting' or 'altering' the intensity instead of increasing it.

Question 5

This was expected to be a relatively straightforward question, but actually resulted in some very poor answers due to poor wording of answers and bad exam technique. In (a), many of the diagrams were sloppily drawn and the label lines carelessly positioned. Although we did not expect three-dimensional drawings, we did expect the drawings to be representative of the biology so that, for example, the vessel wall would be wider than the diameter of the lumen and the diagram would indicate the number of layers present. Part (b) was poorly done by many candidates who failed to appreciate that each component of the vessel wall is present for a different reason. Every structure and function came across as being interchangeable. For example, there were many descriptions of the elastic fibres and smooth muscle cells 'contracting and relaxing' to increase and maintain the pressure of the blood. Candidates need to learn to write one fact in one statement to avoid such ambiguities. In (c), many responses did not actually state differences between the vessels but instead stated facts about one vessel or the other. A surprisingly high number of responses compared veins with arteries. Only the more able candidates scored well in this part and the previous part of the question.

Question 6

In (a)(i), there were some candidates who confused themselves trying to describe the negative percentage changes and there were others who did not make directional comparisons. Candidates who did not make these mistakes picked up all three marks with ease. Parts (a)(ii) and (b) were not so high scoring, except by the more able candidates; the topic of these question parts is new material in the specification. Part (c) highlighted the fact that a number of candidates struggle to grasp some aspects of the How Science Works ideas and the terminology associated with it. There was a lot of confusion between **incidence**, which is what the data was showing, and **risk**, **chance** and **likelihood**. Some of the candidates who tried to quantify their statements were multiplying their values read from the graph by 1,000 to give the total number of individuals with heart disease. The small size of the graph was unfortunate and meant that some candidates had difficulty reading data off from the graph with accuracy.

Question 7

Similar comments apply to this question as to the previous one, although some very good descriptions in (a) were seen. More care needs to be taken by candidates when quoting values from a graph; many values quoted were either vague or inaccurate. There were references to the mid-twenties instead of to 1924 (marking points 1 and 2); and to the drop in number of deaths in 1970 instead of 1969 (marking point 5). In (b), correlation was confused with causation (not surprisingly) and there were few references to the consistent time lag between the changes in numbers of cigarettes smoked and the corresponding changes to the number of deaths from lung cancer. The responses to (b)(iii) indicated that candidates have a good understanding of the validity of surveys. A range of responses was seen in (c), with some good answers.

A number of candidates wasted valuable time by describing the attributes of a healthy lung before eventually answering the question. Command of the English language let other candidates down; a common ambiguity was a reference to the movement of 'carbon dioxide and oxygen into and out of the lung'. Again, the advice is to put one fact in one clause to remove any ambiguity: 'the movement of oxygen into the lung and carbon dioxide out of the lung'.

Question 8

A relatively high number of blank spaces was seen in this question, showing that some candidates has failed to finish. For those centres who had not previously taught SNAB, the topic of this question is new to this specification. Some candidates however, clearly had a very good knowledge and understanding of enzyme action and gene therapy as some extremely good answers were seen. As in Question 3, many candidates did not appreciate the detail to which molecular structure needs to be learnt. Incorrect reference to 'healthy' genes or alleles was commonly seen in (b)(ii). Although we decided not to be too strict about the use of the terms gene and allele (as it is an AS paper and the examiners wanted to keep the mark scheme fairly open), it was still decided to draw the line with the reference to 'healthy'. Some candidates suggested that 'the faulty gene had to be removed from the mice'. There was some confusion describing how the normal gene was introduced into the mice – we had 'viruses in plasmids' and 'liposomes in viruses', to name a few methods! Part (b)(iii) was another example of How Science Works causing some candidates problems. Surprisingly few correct answers were seen.

Maximum mark 80

Mean mark 43.1

Standard deviation 9.6

General comments

This was the first 6BI02 paper sat by candidates. The paper allowed candidates to show both their knowledge and understanding in familiar and unfamiliar situations. Most questions elicited responses that spanned the full mark range, enabling good discrimination to be seen. Whilst the paper comprised 80 marks to be done in 75 minutes, there was no evidence that there was a time issue, possibly partly due to the presence of some multiple choice questions. In general, Questions 2, 3(a), 3(b) and 6 were answered well. It was particularly pleasing to see: candidates successfully tackling questions that required information to be drawn from more than one area of the unit, such as Question 2(b)(ii); candidates demonstrating a sound grasp of How Science Works, such as parts of Question 3; and candidates dealing with material new to the specification such as in Question 6(b) and (c). In a number of instances, candidate responses were poorly worded, giving rise to ambiguity. Generally, candidates found those question items that required extended answers most challenging and many gained only a few of the marks available. Examples of this included Question 4(a)(iii) and Question 7(a)(i) and (b).

Question 1

Answers to (a) were rather variable due to the way candidates expressed themselves. A number of responses lacked the precision necessary to explain the term 'tissue' accurately. However, a good number gave clear and complete answers. Part (b)(i) proved to be quite challenging. Few candidates produced drawings of Golgi apparatus that were sufficiently accurate to gain more than 1 mark, whilst very few added an arrow as requested.

Question 2

It was encouraging to see so many candidates having a clear and accurate understanding of both anaphase and of the term eukaryote. Likewise, many tackled (c) carefully. However, a number of candidates failed to use the table to answer (c)(ii).

Question 3

Most candidates displayed their ability to extract the relevant information from the graph to gain the marks for (a)(i) to (a)(iii). However, a number gave a similar response for (a) (iv) and (v). It should be emphasised that, to score the marks in (a)(iv), the variables had to be different to those already considered in the text, as well as being appropriate to this study. Many candidates seemed to have a rather vague appreciation of the two inorganic ions considered in (c). With reference to calcium, the mention of calcium pectate (pectin) in the table was used to try and focus candidates' answers to relate to the cell wall. However, many still gave correct but inappropriate answers.

Question 4

A number of candidates found this a demanding question. Most recognised the meaning of pluripotent and how the diagram linked to this in (a)(i). Whilst candidates could have tackled (a)(iii) either in terms of the cells given in the stem of the question or more generally, few gave clear and logical answers beyond stating that some genes were active and some were not.

Question 5
The accurate naming of sperm cell structures is expected. Many responses to (a)(ii) focused on fertilisation restoring the diploid number, but some explanations needed more clarity. Few candidates made reference to 23 and 46 (23 pairs) of chromosomes, nor did many extend their comments to cover the other major function of allowing genetic variation. Generally, (b) was accessible to most candidates. However, the most common misconception was to repeat the results, in words, in (b)(i) rather than to comment on the trends seen.

Question 6
The multiple choice item tested a detailed knowledge of polysaccharides and elicited the full range of marks. Pleasing answers were seen to (b), though a number of candidates seemed to confuse biodegradability with sustainability. Most scored one mark or more on (c). The most frequent incorrect response was that 'only xylem vessels are dead'.

Question 7
This proved to be a challenging question for many candidates. In (a)(i), the question asked for features visible in the diagram and for these to be related to the named conditions. It was not uncommon for responses to be given that made little reference to these criteria. Answers to (a)(ii) tended to be more focused; most candidates explained that structure T had to be above the water surface to access the oxygen-rich air. Part (b) enabled some candidates to demonstrate a very clear understanding of the evolutionary process. The best answers tackled the question in a logical sequence. Most comments that gained few marks either tended to detail just one area, or considered that the question was a genetics one relating to cross breeding.

Question 8
The domains are a new component and candidates were generally divided into either those who could recall all three or those who found it hard to name one accurately. There were relatively few who could name two out of three. Many limited their species definition to the production of fertile offspring in (b)(i). Part (b)(ii) was a particularly discriminating item. Some gave very good answers but a number of candidates confused alleles and genes, or genetic diversity and species richness. Part (b)(iii) enabled many candidates to display a good grasp of the role of zoos in maintaining the genetic diversity of endangered species.

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 B.

For AS examinations, the two examined unit tests (6BI01 & 6BI02) each have a weighting of 40% with a maximum of 120 uniform marks; and the coursework unit* (Unit 6BI03) has a weighting of 20% with a maximum of 60 uniform marks.

For the A2 units, the two examined unit tests (6BI04 & 6BI05) also each have a weighting of 40% with a maximum of 120 uniform marks; and the coursework unit* (Unit 6BI06) has a weighting of 20% with a maximum of 60 uniform marks.

Therefore, for candidates taking the full A level, the four examined unit tests (6BI01, 6BI02, 6BI04, 6BI05) each have a weighting of 20% with a maximum of 120 uniform marks; and the two coursework units* (Unit 6BI03 & 6BI06) have a weighting of 10% with a maximum of 60 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.

Unit grade boundaries

Unit	**Maximum mark**	**Grade**				
		A	**B**	**C**	**D**	**E**
	Uniform marks					
	120	96	84	72	60	48
	Raw marks					
6BI01 (Unit 1)	80	52	47	42	37	33
6BI02 (Unit 2)	80	52	47	42	37	33

*or written alternative for International centres

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 for A and E 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

A candidate for AS Biology or must take three modules, weighted at 40% for the two written units (6BI01 & 6BI02), and at 20% for the coursework unit (6BI03).

	Uniform mark obtained	**Approximate level of performance**
Unit 1	78	C
Unit 2	88	B
Unit 3	50	A
Subject Total	**216**	**Subject Grade = B**

Table 2 – Advanced Level Subjects

Subject		Unit Weighting				
Grade	**UMS**	**10%**	**15%**	**$16^{2}/_{3}$%**	**20%**	**25%**
Max mark	**600**	**60**	90	100	**120**	150
A	**480**	**48**	72	80	**96**	120
B	**420**	**42**	63	70	**84**	105
C	**360**	**36**	54	60	**72**	90
D	**300**	**30**	45	50	**60**	75
E	**240**	**24**	36	40	**48**	60

A candidate for A level Biology must take six units, weighted at 20% for the two written units (6BI01, 6BI02, 6BI04 & 6BI05), and at 10% for the coursework units (6BI03 & 6BI06). The candidate in this example has five units in the bank.

	Uniform Mark Obtained	**Approximate level of performance**
Unit 6BI01	86	B
Unit 6BI02	76	C
Unit 6BI03	44	B
Unit 6BI04	98	A
Unit 6BI05	*	
Unit 6BI06	36	C
	Partial Total in Bank = 340	

The candidate already has 340 uniform marks in the bank. If a Grade C is required in the subject, the candidate must obtain at least 20 UMS marks from Unit 5 or if a Grade B is required the candidate must obtain 80 UMS marks or more from Unit 5.

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