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Examiners' Report January 2007

GCE

GCE SNAB Biology (8048/9048)

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Contents

Maximum mark..... 60

Mean mark 35.0

Standard deviation 10.3

General comments

Though the paper produced a wide range of marks, good candidates scored more highly than on previous papers which is encouraging. They displayed sound knowledge of all aspects being tested across both topics. Whereas on previous papers candidates scored badly on questions related to core practicals, the gel electrophoresis and gene probe techniques tested on this paper were generally well explained. As noted on previous papers, there is a general lack of detailed knowledge exhibited when tackling biochemistry questions and examiners also noted a general lack of care when producing genetic diagrams.

Question 1

Part (a) was generally well done with the majority of candidates scoring at least two marks and many scoring full marks. Only very weak candidates did not score at least one mark. A common error made was to ignore the reference to membrane proteins in the second process and to therefore to identify osmosis of as the passive, process instead of facilitated diffusion. Part (b) (i) also produced many good responses. However, in the case of a significant minority, there was confusion about whether osmosis is from low to high or high to low concentration with further confusion about whether movement was solute or solvent. Many candidates who understand that osmosis is the movement of water had difficulty explaining that diffusion referred to a variety of molecules as well as to water and considered that diffusion simply referred to oxygen and carbon dioxide only. There were some references to 'with or along the concentration gradient' or 'from an area of high concentration gradient' which were not clear enough to gain credit. Although not specifically worded in the specification, candidates who had been taught osmosis in terms of water potential gave clearer answers to this question. Part (b) (ii) produced many good responses and no problems for the majority of candidates. The term 'bulk transport' was most frequently used as a similarity, though an appreciable number referred to the use of vesicles or energy being needed for the processes. Only a minority referred to a similarity as the processes being passive or using channel proteins.

Question 2

Part (a) was generally well done, most marks being gained for the first two points on the mark scheme. Apart from a very small minority, most candidates are aware that the narrowing of the lumen results in an increase in blood pressure. The mark scheme was quite generous here so examiners were looking for a specific reference to damage to the artery <u>wall</u> or some reference to triggering the blood clotting process to gain the second mark. Part (b) (i) was a very accessible question for candidates who had clearly learned the blood clotting process.

Weak responses tended to refer to prothrombin being released or thromboplastin turning into prothrombin; or thrombin turning into fibrinogen. Only very weak candidates mix up the stages completely or had the reactions turned around e.g. thrombin changed to prothrombin. Part (b) (ii) was generally well done by many candidates, though the candidates scoring full marks were correctly referring to the effects on the heart muscle or the clot blocking the coronary artery. Weak responses referred to strain on the heart, particularly in terms of the heart trying to beat harder due to the blockage, showing no progression from GCSE.

Question 3

Part (a) (i) was generally well done and a good discriminator at the E/N level. Part (a) (ii) produced some disappointing responses for a number of reasons. Some candidates failed to understand or read the context of the question, and in family tree B had both parents heterozygous for the gene, presumably assuming that HD is recessive like cystic fibrosis. There were several comments from examiners including:

- **Genetic diagrams were often badly presented**. Many were simply difficult to decipher – scruffy, careless.

- **Gametes not indicated clearly**. Where people had used the 'arrows' method they had not included a line for parental gametes and consequently lost one mark. Sometimes the gametes line was (or might have been in the case of some very badly presented examples) there but wasn't labelled. The punnett square is a stylised form of presentation where it isn't necessary to label 'gametes' if the conventions are followed properly. But some people couldn't be bothered even to put lines on the punnett square and in some cases it wasn't obvious what were supposed to be gametes.

- **Lack of understanding of the fact that the deleterious allele was dominant** – frequent references to heterozygotes as 'carriers'. A significant minority can only cope with the genetics of cystic fibrosis at GCSE level and are unable to transfer knowledge and understanding to other examples.

- **Poor understanding of the idea of chance/probability** in interpretation of genetic diagrams. Risk is an important idea in other topics in 6131 too but where candidates have knowledge of it few can apply such knowledge intelligently.

- **Inability to use intelligible English** to annotate their diagrams and to provide explanations such as '*the diagrams show that the probability of a child in this family not suffering from HD is 50% every time a child is born. This is quite a strong probability and so, in a family of only three, it is quite likely that all three could be homozygous recessive (hh) and thus not suffer from the condition'.* Most were not operating anywhere near this level.

Part (b) was generally accessible and many candidates gained full marks for this, and there were many good answers – although some which gained full marks were much better than others. Apart from weak candidates, it was obvious that this technique is familiar in terms of practical or simulated procedure. The question did discriminate well in terms of the use of the gene probe, which only good candidates explained well. Weaker candidates often produced the relevant terms but not in any correct sequence and failed to gain any credit.

Question 4

Part (a) (i) proved to be a good discriminator – there was a full range of responses. Some candidates failed to read the question and completed a short hydrocarbon chain. Many obviously have not learned amino acid structure in detail! This may well be centre based in terms of response. In (ii), many candidates were able to get marks by mentioning alpha helices, tertiary structure, R groups and examples of bonds – yet some gave the impression of not having a joined-up understanding of this topic and where they did they had difficulty articulating it. There was some confusion about bonding in secondary as opposed to tertiary structure. Only good coherent accounts scored full marks, with some candidates failing to refer to bonding between R groups and how this allows further folding into a precise tertiary structure. Part (b) generally scored well – almost everyone got full marks – because they had a good understanding of the topic. Only a small minority of candidates failed to change thymine to uracil or incorrectly sequenced the DNA code. Incorrectly identifying translation as the process was thankfully rare.

Question 5

Part (a) proved to be a very good discriminator. Only good candidates gained full marks. The hardest question appeared to be bottom line left. Few candidates, including many good ones, do not know that membranes have polysaccharides. In (b) (i), many candidates knew the answer but did not gain the mark because they spoke of double and single bonds without mentioning carbon atoms and we were strict on this requirement. Part (ii) was generally well done but too many candidates were unfamiliar with starch and glycogen structure, referring to starch or glycogen as a mono- or disaccharide. Only very good candidates correctly refered to amylose and amylopectin structure; most correct responses were for where they are stored.

Question 6

In (a) (i), some candidates lost a mark by saying that one should eat *more* unsaturated fat or 'less saturated and *more* unsaturated fat' rather than 'unsaturated fat *instead of* saturated. Actually some weak candidates got a mark by just saying 'eat less fat' whilst good candidates lost marks with more convoluted answers but this could not discriminate on a one mark section. Some candidates do have a misconception that we consume LDLs! There were also some references to low cholesterol butter. More discrimination came in (ii) with many scoring zero by talking about cholesterol being left in the system but only very good candidates who had a good understanding gained full marks. There was good discrimination between zero, one and two marks with some candidates gaining the mark for either genetic factors or the body producing cholesterol, but only better candidates being able to go further and provide an explanation. Many candidates scored both marks for the calculation in (b) (i), but a minority failed to attempt it at all and some clearly do not know how to calculate a percentage. Most named the correct statin, but (iii) was more discriminating. Many candidates could not articulate their answer well. Many got a mark for using the word 'reliable' but not if they used the word 'accurate'; one suspected the words were being used interchangeably. The best answers were where candidates had made intelligent observations about variation and variables expressed in a common sense way. Similarly, explanations of the need for a control showed a disturbingly unscientific approach to 'how science works' transferable skills. Many simply refer to having something to compare with or to make it a fair test. Only good candidates scored full marks here.

Question 7

In (a) (i), many scored two marks for identifying two different trends but few gained the third mark for use of figures or that there was something different about 1986. It was disappointing to see such poor use of secondary data in a 'how science works' skills way. Part (ii) produced some rather superficial answers – most scored only one mark for 'lack of exercise'. Some rambled on a lot about the evils of junk food but few mentioned commercial pressures; few recognised it was about energy *balance* and many attempts to explain differences between obesity levels in males and females were weak. In (b), the calculation was generally well done – surprisingly many failed to say whether this meant the person was or was not obese and lost a mark! In (c) many candidates gained three marks for increased blood pressure, possibly leading to atherosclerosis, possibly leading to a stroke/CHD. Weaker candidates failed to make reference to blood cholesterol or Type II diabetes and lost marks and again some referred to strain or pressure on the heart or arteries. Some responses wasted time by initially describing how a person becomes obese.

Maximum mark..... 60

Mean mark 37.9

Standard deviation 8.8

General comments

There was very little change in the mean mark for the paper in comparison with recent sessions, suggesting that responses from candidates were of a similar standard. The questions appear to have been accessible again, with very few responses showing a complete misunderstanding of the requirements of the question, and candidates seemed to be aware of the necessary level of precision and detail.

Candidates were able to provide clear answers, with even the more challenging questions producing some excellent responses, although poor expression was a reason for lost marks as is normally the case. Once again, there was considerable evidence that candidates were adept at applying their understanding to unfamiliar contexts.

The most common areas for poor scoring appeared to be where recent changes have been made to the specification. In particular, the need to know the work of Malthus and the different types of antibiotic seems to have been overlooked by a number of candidates.

Question 1

It was rare for candidates to score badly on this question, as is usual with the forensics topic. Most were able to identify the important elements of succession, and the use of a key was familiar to candidates. The most common error was to ignore the reference to a key in the question and to try to explain other methods for identifying the organisms. Few candidates had a problem with estimating the days elapsed since death, and the explanation of inaccuracy in the method was also done well. Methods of identification are well known, although some lack of attention to the stem caused candidates to suggest using personal effects. The most common error where a suitable method was chosen was to omit some reference to comparison with existing records.

Question 2

This question allowed a wide range of responses, and it was easy to detect which pupils had made a study of a habitat, and which were basing their answers on generalisations. The specification does require candidates to study a named habitat. The techniques for estimating abundance were quite well understood, although some candidates described inappropriate random methods for choosing the position of a quadrat. Biotic and abiotic factors presented few problems, although the discussion of how to measure the chosen abiotic factor often lacked the detail required for both marks. A wide range of adaptations were described for primary producers, many of which were appropriate, but clearly some had not been considered in advance. A number of seaweeds had extensive root systems to avoid desiccation, for example, and the more obvious adaptations such as photosynthetic pigments were frequently overlooked.

Question 3

Knowledge of the immune system and genetics was good on the whole, with candidates often scoring highly on this question. The diagram presented good candidates with few problems, although weaker candidates had difficulty in describing the clone of activated B cells. The mark scheme was quite broad for this point, however, and those who understood the process frequently gained the mark. Part (b) was well done, although the particular type of lymphocyte involved was not always identified, and some focussed on the initial infection with HIV rather than AIDS.

The genetics problem was almost trivial for good candidates, and although the setting out of genetic diagrams leaves much to be desired, most gave sufficient detail to gain full marks. Where a mark was lost by these candidates it was often related to probability, where some failed to give an actual answer to the question, and others appear to consider 1 in 4 and 1:4 to mean the same thing. Some made careless errors, which was often exacerbated by duplicating gamete types, suggesting a lack of understanding that these represent probabilities. Weak candidates often struggled to gain any marks for (c) since they were not able to identify the possible gametes correctly. Symptoms of AIDS often lacked sufficient precision to be awarded a mark, but many were able to gain some credit.

Question 4

There were some particularly pleasing responses to this question, with candidates being able to apply their understanding to the context. The majority of candidates have been taught to give more than a trivial response to descriptions of trends and hence gained the mark for (a). Those who stated the obvious or tried to describe every point of the graph were unlikely to get the mark.

Calculations are still a problem for many. There was less evidence that candidates had arrived without a calculator this time, but being able to find 85% of 60 million is expected at this level. The question could have been worth more marks for good candidates, since it required careful reading of the material provided, but this would have penalised weaker candidates disproportionately. The number of candidates happy to accept that 85% of 60 000 000 was 51 (or perhaps that world production of palm oil is 60 tonnes) was rather disappointing.

The description of changes to the distribution of orang-utans was well done, although answers about population size were surprisingly common. The effects of isolation and smaller population sizes on genetic diversity were well explained by a pleasing number of candidates, although a significant misconception was that consequent genetic drift would increase genetic diversity.

Discussions of the effects of palm oil plantations showed that many candidates were aware of the wider implications of environmental change. Good candidates scored at least three marks by covering the areas specified in the question, and a significant number were able to go on to describe issues in more detail to gain full marks. Weaker candidates resorted to repetition and opinion rather too much, but often discussed something worthy of credit.

Question 5
This turned out to be a very accessible question for most, and good answers were common. Part (a) was recognised for what it was by the majority and answers described the differences between bacteria and viruses. It seemed that some candidates had not looked at different types of antibiotic, since they were not able to give sensible suggestions for (b), but those who knew about bacteriocidal and bacteriostatic antibiotics gained the marks easily. There was a similar pattern for (c), but there were very many clear and accurate answers.

Question 6
The specification statements for parts of this question were not present in the pilot specification, which may have caught out some, but there were many candidates that were unable to attempt parts of this question.

It was hoped that candidates would be aware of how Darwin was influenced by the work of Malthus on populations, but some had clearly never heard of him, whereas others confused him with Mendel or Wallace. This is covered by a statement in the specification, and a significant part of Darwin's work depends upon an understanding of population growth leading to competition. It would be encouraging to see descriptions of how competition comes about instead of phrases such as 'struggle for existence' being used without explanation.

In the same vein, (b) was littered with 'struggle for existence' and 'survival of the fittest' without further comment. It is very unlikely that such phrases will be given credit when an explanation is required, since they do not demonstrate understanding in themselves. Indeed, weaker candidates often went on to describe the misconceptions often associated with these phrases. More encouraging were responses describing Lamarck's theory, and in particular the differences from Darwin's explanation of natural selection.

The final question discriminated quite well, with good candidates able to explain the link between natural selection and genes, and explanations of how it might undermine Lamarck were generally very clear.

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
	Uniform marks					
	90	72	63	54	45	36
	Raw marks					
6131 Unit SN1	60	46	41	37	33	29
6134 Unit SN4	60	47	43	39	35	31

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	4 762	17.6	33.5	46.6	60.0	72.9
6134 Unit SN4	2 045	17.3	32.8	49.2	65.6	79.5

AS cash in	Entry	A	B	C	D	E
8048	234	13.7	30.8	56.8	79.9	98.7
9048	1	0.0	100.0	100.0	100.0	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
Subject Total	**218**	**Subject Grade = B**

Table 2 – Advanced Level Subjects

Subject		Unit Weighting				
Grade	**UM**	**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 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**
Unit1	59	C
Unit 2	73	C
Unit 3	69	B
Unit 4	82	A
Unit 5	*	
Unit 6	*	
	Partial Total in Bank = 283	

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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