

Examiners' Report Summer 2007

GCE

GCE SNAB Biology (8048/9048)

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Contents

			pg
Unit SN1	6131	Lifestyle, Transport, Genes and Health	1
Unit SN2	6132	Development, Plants and the Environment	3
Unit SN3	6133/01	Visit or Issue Report	7
	6133/02	Practical Work Review	14
Unit SN4	6134	Environment and Survival	16
Unit SN5	6135/01	Written test: Energy, Exercise and Coordination	19
	6135/02	Coursework Investigation	21
Unit SN6	6136	Synoptic paper	24
Unit Grade Boundaries and Uniform Marks			29
Provisional Statistics			31
Appendix A The Uniform Mark System			32

6131 Unit SN1**Examiners' Report**

Maximum mark..... 60

Mean mark 30.7

Standard deviation 12.9

General Comments

This paper contained several different styles of question giving candidates the opportunity to display their knowledge and understanding of Lifestyle, Transport, Genes and Health material. A wide range of marks was seen and a number of detailed and considered responses were provided by candidates.

In general, questions 1(b), 2, 3 and 6 (a), (b)(i) and (ii) were answered well. Further, it was encouraging to see that the vast majority of candidates attempted all question parts and none of the questions was inaccessible. However, all questions produced a gradation of marks and several had very good discriminating properties.

In a number of cases, the way candidates answered the questions led to ambiguity and it is clearly very important that candidates consider carefully their responses. It would also be beneficial for candidates to make sure they consider the context of the question and tailor their answer accordingly.

Question 1

Much of this question was tackled well, with candidates having a good knowledge of diet. However, only a minority of candidates appeared to have a clear and full appreciation of how atherosclerosis could cause the chest pain associated with an angina attack.

Question 2

There were many high scoring answers to this question. The majority of candidates accurately displayed the direction of blood flow through the heart but some ignored the closed valves. Part (b)(i) appeared to be the most challenging with a number of candidates suggesting that the blood just 'washed' back and forth into and out of the heart.

Question 3

The majority of candidates displayed a good grasp of the genetic cross required. The most common errors appeared to stem from not reading the question carefully enough. Either no account was taken of the reference to the mother being heterozygous or that a probability was asked for.

In (b), it was particularly encouraging to see so many clear and detailed answers relating to gel electrophoresis and many candidates achieved all 5 marks. A number of candidates confused agrose with agar and the sequence of events such as adding a gene probe immediately after filling the wells and before the current was applied. A few candidates described amniocentesis or CVS.

Question 4

This question was a discriminating one.

In (a)(i), very few candidates were able to name Z and a similar number seemed to be able correctly to recognise a transport system other than (simple) diffusion in (a)(ii).

Part (b) also elicited a range of marks and a variety of answers. The most frequently seen error was when a candidate focused on the idea of reduced absorption of material across the gut wall rather than digestion of food as asked by the question. Having said this, the majority made a link between more sticky mucus and the potential blocking / partial blocking of the pancreatic duct hence reduced secretion of gut enzymes. Few, however, gave sufficient detail to score full marks.

Question 5

Many candidates seemed to lack sufficient factual knowledge to tackle this question fully. For example, a variety of bond names was given for (a)(i). Part (a)(iv) was perhaps the least well-answered section, with few candidates taking note that the question requested a physical property rather than a chemical or molecular one.

Question 6

The structure of nucleotides seems to be well understood by the majority of candidates and most showed their ability to use the table to correctly respond to (b)(i) and (ii).

Part (b)(iii), however, proved a discriminating question due to the mutation affecting a protein involved in protein synthesis (RNA polymerase). Most candidates appreciated that the mutation would alter the shape of the protein and hence its function but only a minority followed through the idea that the mutation for RNA polymerase would reduce mRNA production and hence subsequent protein formation.

Question 7

This question delivered a range of marks and was a good discriminating question. Most candidates successfully tackled (a) and (b)(i) but found the other two components more challenging.

In (b)(ii), answers tended to lack the precision to score all available marks with most only making correct reference to the specificity/shape of this enzyme. A common response was that the bonds were stronger in proteins and the enzyme was not 'strong enough' to break them.

6132 Unit SN2**Examiners' Report**

Maximum mark 70

Mean mark 30.6

Standard deviation 10.4

Question 1

This apparently straight forward question was actually quite searching and assumed not only knowledge of the structure of gametes but also knowledge of cell ultra structure. It called for accurate and precise knowledge and understanding and was generally well done.

Question 2

This question assumed that candidates have carried out the core practical (specification 2.3.6 and associated SNAB activity) involving the preparation of microscope slides to show chromosomes. Those who had done so had little difficulty in answering (a) and (b) although there were some responses which suggested that a significant minority were unfamiliar with the practical activity. Few understood the role of the acid in facilitating maceration in (c). Most candidates were able to label centromere and chromatid in (d).

Question 3

The many poor responses to this question suggested that many candidates were unfamiliar with item 2.4.10 of the specification on which this question was based. Most candidates gained a mark for suggesting that sycamore seeds are dispersed by wind but few gained the second more discriminatory mark by referring to a large surface area or adaptation to prolong descent. The numerous references to the seeds 'flying' with 'wings' were not credited. Many candidates did not use terms such as 'seed coat' or 'testa' and few seemed to understand 'nutrition' in terms of, for example, stored starch as a source of energy for germination. Few were aware that seeds contain a store of proteins for growth of the potential seedling.

Question 4

Some candidates misinterpreted (a) by not linking the three statements (i to iii) to the stem in terms of how they might explain the increase in height of people over the past 150 years. Some based their answers on discussing whether tall men had more children because they were more 'successful', ate better, had more partners or were sexually more desirable than short men. The interaction of genetic and environmental factors in determining growth and development of organisms is an important recurring theme in unit 2 (see particularly specification 2.3.14) which appears in different contexts in several questions on this paper.

Some candidates tried to answer (a)(i) in terms of environmental influences but most gained a mark for recognising the importance of genetic factors. Only some went on to gain a second mark for explaining that tall men would not only pass on genes for tallness to the next generation but in a greater proportion to those for 'shortness'. The question discriminated well, although few candidates achieved full marks. In (ii), a worrying number of candidates did not respond simply by observing that protein was essential for growth and repair. Some seemed to believe that protein's principal function is to provide energy, calcium, vitamins or minerals.

Only a minority regarded protein as a source of amino acids. The question was discriminatory in that the better candidates recognised that protein availability was no longer the factor limiting growth of children that it was in the past, or that adequate protein in the diet was required for a child to fulfil his or her genetic potential. Most candidates achieved a mark in (iii) for realising that reduction in infectious diseases would allow more energy to be invested in growth rather than fighting disease; or for recognising that many diseases suffered by children in the past stunted growth. Weaker responses referred to "more time" to spend on growing. Some misunderstood the question by referring to improvements in hygiene, vaccination and health care.

Many candidates scored full marks in (b), based on specification item 2.3.15. The knowledge demonstrated by some of the better candidates went beyond that required by the specification and they knew more than enough to gain the 3 available marks.

Question 5

This question used an unfamiliar context to explore the possible effects of climate change on biodiversity and life cycles (specification 2.4.20) and related these to the interaction of genetic and environmental factors.

Most candidates recognised the importance of enzymes (specification 2.4.21) in (a) although some failed to gain the mark by suggesting that low temperatures caused denaturation. In (b), most candidates recognised this as a possible consequence of climate change. Many candidates found (c) difficult but there were some good suggestions in terms of the advantage of hibernating just *before* the onset of cold weather or of day length being a more reliable indicator of approaching seasonal change than temperature. Many candidates gained 1 mark in (d) by recognising that there must be a genetic component in the difference in behaviour between the two populations. Only a minority of the better candidates gained the final mark by recognising the complexity of the interaction between genes and environment - the genetic component controls the response to an environmental factor - day length. In July in Florida, the days are shorter than in Canada.

Question 6

There were plenty of very good responses to this question yet many candidates found it difficult and scored low marks, particularly on (a) and b. There were many instances of incorrect answers being provided as a consequence of misreading the questions.

Part (a) was set in the context of gene switching (specification 2.3.12) and general understanding of cell structure (2.3.1) but with some extra information provided in the stem. This was a discriminatory question, as the more able candidates were able to gain full marks by explaining in detail the sequence of events. Many other candidates, however, did little more than write out the contents of the boxes without making much attempt to process the information themselves. Some good answers concerning the relative sizes of the two molecules were seen in (b), although many lost marks through failing to refer to nuclear pores in the membrane. Bizarrely some thought that the presence of uracil rather than thymine made mRNA a much smaller molecule, instead of it being a single strand equivalent to a small section of DNA. Many answers referred to the damage that would occur to the DNA molecule in the cytoplasm, forgetting that during mitosis the nuclear envelope breaks down anyway. There were many good answers in (c) showing a thorough grasp of protein trafficking - although many lost marks through failing to refer specifically to **rough** ER. Some weaker candidates confused the proteins with the vesicles. However, this was a well answered question, with many candidates demonstrating a good understanding of the folding and modification of the polypeptide chain after it leaves the ribosome.

Weaker candidates mentioned vesicles, Golgi and endoplasmic reticulum in a random order, which is insufficient when dealing with a process that takes place in a particular sequence.

Question 7

This question is based around the carbon cycle (specification 2.4.16).

Most candidates scored full marks in (a). In (b)(i), many candidates seemed familiar with the expression 'carbon sink' but had difficulty in expressing themselves clearly enough to gain the mark. The idea the examiners were looking for was that the sink represented carbon (dioxide) taken from the atmosphere and removed from the cycle. In (ii), many answers were poorly phrased and lacked clarity, yet there were plenty of candidates who gained at least one of the two marks available. Part (c) was a discriminating question where many candidates gained a mark for realising that there simply isn't enough room to plant enough forest to balance carbon dioxide production from the current number of cars in use. A smaller (yet significant) number were able to explain that as a forest matured it tended towards carbon neutrality or that eventually the wood of the trees either decayed or was burnt releasing CO₂ in either case. Many good answers but also many others that were confused and poorly worded.

Question 8

The poor quality of many responses to (a) was disturbing, suggesting not only that at least some candidates had not covered this topic (specification 2.4.15) but also that some had poor scientific understanding of a matter widely discussed in the media. There were many confused references to the hole in the ozone layer being somehow involved in enhancing the greenhouse effect. Some thought that it was the gases (as opposed to infra red radiation) that warmed up the atmosphere. The question was marked using a levelled mark scheme. A significant number of candidates scored zero because they were unable to differentiate global warming and greenhouse effect at the most basic level. There were, however, many who did achieve one mark and a significant number who gained a second mark for providing some accurate details, naming more than two greenhouse gases and describing how they absorbed infra red radiation. Only the better candidates gained the third mark for either emphasising the speculative nature of the link between climate change and greenhouse effect or distinguishing the 'natural' greenhouse effect and the enhanced greenhouse effect thought to be caused by anthropogenic burning of fossil fuel

There were many very poor responses to (b), not only suggesting that some candidates had not covered the climate modelling item of the specification (2.4.19) but that many had poor graph skills. In (i), very few accurate curves were drawn - many fail to understand that a line of best fit does not have to be drawn with a ruler, in fact some stated in (iii) that the line would have been better as a curve after drawing a straight line. In (ii), very few realised that not only should the best fit line be a curve but that it needed to be extrapolated as a curve too; yet this is clearly described as the basis for mathematical modelling in the SNAB text book and further explored in several SNAB activities. Some strange calculations of the gradient of the line were used to estimate the rise in temperature, rather than extrapolating the line. Many candidates had difficulty coping with the scale used, which indicates a lack of necessary basic mathematics skills. Those who did extrapolate the line as a curve (as intended by the examiners) found the scale used on the graph much easier to work with. In (iii), many candidates seemed to believe the figures referred to actual temperatures and not the departure from long term mean and then made references to extraordinarily low mean temperatures. Most managed to refer to the fluctuations as a factor making the estimate unreliable but only some managed to quote figures in a way which developed this idea.

Many seemed to completely misunderstand the notion of estimates based on trends in data. Extrapolation takes into account many current trends and so weak claims that one can't be sure what will happen in the future did not gain credit. Only a specific example of something completely unpredictable (such as a volcanic eruption releasing large amounts of carbon dioxide, or an expected technological advance in energy technology likely to impact on existing prediction) gained the appropriate mark.

There were many good responses to (c) - suggesting and explaining biological effects of small increases in global temperature. The examiners credited a wide range of these including many that were not on the original mark scheme such as disruption of synchrony between parts of a food chain and in patterns of migration, dormancy and hibernation. It was particularly pleasing to note that some candidates adapted ideas suggested in question 5 to answer this question.

Question 9

Many candidates gained full marks for (a)(i) and (ii). In (b)(i) many knew little, if anything, about culturing stem cells in terms of producing more of them by providing them with conditions which maximise cell multiplication. Few could name a suitable vessel - the examiners would have accepted 'in a test tube' or 'in a petri dish' for one mark. Candidates seemed to know quite a lot about stem cells but seemed quite incapable of visualising how cloning techniques were carried out. Answers to (ii) were much better. Most candidates understood the importance of *cell* specialisation but only some went as far as saying that this gave rise to specialised *tissues*. In (c), a large number of candidates appeared to be confused about the developmental stages of the human embryo - not understanding the progression from blastocyst to foetus. Many believed that stem cells were harvested from aborted foetuses, or that the embryos were removed from women against their will. There were many vague responses referring to the "life" of the embryo rather than its potential to become a human. The "for" arguments often vaguely referred to a "better standard of life" and the curing of "many diseases", answers lacked specific examples. Better candidates realised that excess embryos from IVF treatment are proposed to be used for stem cell research and that there is a difference between the research and the applications of the research in stem cell therapy. Good candidates were also aware of the types of conditions which stem cell research is seeking to establish treatments for. In order to achieve all four marks a candidate had to show awareness of opposing ideas. There were some very good responses to this question worthy of high marks where candidates demonstrated their ability to think ethically and to weigh arguments. But there was also a tendency for too many candidates to rehearse memorised and undigested arguments without relating them specifically to the context of the question. Another tendency was to present an argument that was presented eloquently but which was based on very weak scientific knowledge.

6133/01 Unit SN3 Visit/Issue Report**Examiners' Report**

Maximum mark 20

Mean mark 10.4

Standard deviation 3.4

Types of reports

Out of a sample of 702 projects, 61% were Visit reports and only 39% were reports on Issues. As in previous years, this is yet another increase in the *variety* of Issue reports and the number of Visits. The further increase in variety of Issue reports is especially welcome since in the first year of the pilot in 2003 there were far too many rather unoriginal Issue reports on topics such as Global Warming, Cloning, Gene Therapy or Cystic Fibrosis.

However, although there is a further 25% increase in the variety compared to 2006, Issue topics such as Global Warming, Stem cells, IVF and Cystic Fibrosis are still the most popular, presumably because they are 'safe' and covered in the SNAB books. Breweries and zoos are still the most popular venues for a Visit with far more schools going to a zoo compared to the pilot, but there has been no further increase in the variety of visits. It is interesting that there seems to be yet another increase in the number of schools using a Visit rather than an Issue for this coursework assessment. A Visit to see '*Biology in action*' rather than just explore the biological aspects '*virtually*' is certainly more in keeping with current Key Stage 4 and vocational developments on 'How Science Works', encouraging schools to focus more on Science in Action, what scientists do and the scientific method.

Although there was again a larger variety of topics chosen for the Issue reports, yet another increase in the % going on Visit and a slight overall improvement in the marks, there were still many that found section B difficult. Speculating about the future and checking the validity of the source material proved especially difficult.

For more detailed comments on the individual assessment criteria, see below.

Issue Topic	%
Stem cells	14.8
Global Warming	7.8
IVF	3.3
Cystic Fibrosis	3.0
Sickle Cell Anaemia	2.2
Alzheimer's	1.9
Breast Cancer	1.9
Doping	1.9
Leukaemia	1.9
MS	1.9
Obesity	1.9
Alcohol	1.5
Cancer	1.5
Cloning	1.5
Diabetes	1.5
MRSA	1.5
Anorexia	1.1
GM Crops	1.1
Haemophilia	1.1
HIV	1.1
Malaria	1.1
Rabies	1.1
Recycling	1.1
<p>together with Aspirin, Asthma, Binge drinking, Down's Syndrome, Barter's syndrome, Epilepsy, Extinction, Huntingdon's disease, Immune system, Lupus, Motor neurone disease, Multiple Births, Parkinson's, PGD, Polar bears, Shark antibodies, Telomeres, Aloe Vera, Angelman syndrome, Angioplasts, Anthrax, Antibiotic resistance, Artificial heart, Atkins diet, Biofuels, Bird Flu, Blood doping, Blood substitutes, Brazil nuts, Burns, Caffeine, Antigens, Cervical Cancer, Chromosome defect, Conjoined twins, Creatine, Crohns disease, Dairy cattle, Deforestation, Deodorants, Manic depression, Alien species, Digestion, Epigenetics, Epilepsy, Exercise, Face transplants, Fish, Flu, Fox gloves, Genetic engineering, Glandular fever, Global warming and penguins, Glofish, Haemochromatosis, Hallucinogenic drugs, Hayfever, Amazon, Human / Cow embryos, Insomnia, Leprosy, Alien species, Migraine, Morning sickness, Motorcycle safety, Musth in elephants, National DNA database, Natural dust, Neurofibromatosis, Orang-utans, Ovarian cancer, Oysters, Pests, Pollution, Poppies, Post traumatic stress disorder, Parasites, Premature babies, Prenatal testing, Rennet, Right handedness, Skin Cancer, Smoking, Snake venom, Spanish Flu, Spina bifida, Superhumans, Biopiracy, Testicular cancer, Tetracycline & Gum disease, Thalassaemia, Tigers, Tobacco plants, Tourettes, Turner's Syndrome, Water, Witch hazel, Osteoporosis, Drug trials.</p>	

Visit Topic	%
Zoo	25.0
Brewery	25.0
Natural History Museum	18.0
Jealotts Hill Research Centre	7.0
Living Rainforest	3.7
Woburn Safari Park	3.5
VLA	2.8
West Lakes Science Park	2.8
Kew Gardens	2.6
Horniman Museum	2.1
Wight Salads	1.6
Rutland Water	0.7
Salmon Farm	0.7
Oxford Botanical Gardens	0.7
Cotswold Wildlife Park	0.7
together with Aquatic Centre, Sewage works, Hospital, Rothamstead Research Centre and the Universeum.	

Marks awarded.

The sample of scripts this summer suggests a slight improvement on last year (in brackets) with the Visit reports again slightly better than the Issues with a mean of 11.1 (10.8) compared to 10.8 (10.4), this difference not being significant.

The distribution of marks for the various criteria is shown below as a % of possible total i.e. 100% for Aa would mean that all students got the maximum of 2 marks.

Criteria	Issue 2006	Issue 2007	Visit 2006	Visit 2007
Aa	82	83	87	90
Ab	75	79	78	79
Ba	54	53	56	56
Bb	31	33	29	34
Bc	27	34	30	37
Ca	67	68	72	68
Cb	73	75	75	76

The data seem to show no further improvement for Sections A or C for either Visits or Issues. For most reports, the two aspects were clearly stated and discussed in reasonable detail and a consideration of the ethics, environment, economics and social aspects was given. Candidates are much better at writing for an audience and giving a bibliography whose sources have been acknowledged in the text.

However, Ba is still much lower than one would like. Most candidates had no problem in providing biological background material but many accounts were still too descriptive. There was not enough of a discussion to indicate full understanding.

Despite feedback last year, the weakest marks still seem to be for Bb and Bc in both cases, although there was an improvement in the marks for Bc. Many candidates did not speculate about future developments but an increasing number did look at the validity of their source material.

A - Purpose of Visit of Significance of Issue

The data show that both the Visit and Issue reports still scored more highly than for the pilot indicating a greater awareness of the biological issues involved in the topic and for many centres this was a strength. Going from one extreme to the other - some centres had their candidates summarise their aspects, main aspect and target audience in a box either at the beginning or end of the work, as they have in other years. In other centres candidates had an introductory paragraph to do the same.

However, other centres had many candidates whose stated aspects were very muddled and didn't fit the text written. Some did not state a main aspect and some centres had many candidates who gave no aspects. Some of these may have had obvious headings, but others did not. Where there were no aspects and no subheadings it was often nearly impossible to create an area of the work to call the main aspect. In quite a few instances the candidate had not covered their minor issue in sufficient detail and lost a mark. Some candidates identified their two aspects but chose a main one that had little biology associated with it, making Section B more difficult.

Ab was often a strength for many centres as well and candidates did make reference to these implications. However, some candidates had done this well and others had given only the briefest mention - yet both responses would have gained the same marks so there was little room for differentiation here. Again, more candidates went on visits where they were able to talk to working scientific staff. This gave them insights into research methods, field trials, laboratory procedures, animal welfare etc. This clearly enhanced their reports because it was easier to consider future developments.

9.3% of students failed to clearly identify the two aspects of biological interest that they were looking at and as a result scored zero for Aa. It is essential that teachers draw candidates' attention to this.

This loss of marks was far worse for the Issue reports (15%) than the Visit reports (3.1%), presumably because it will be easier to identify two aspects when actually seeing or hearing about them first hand.

B. - Biological principles.

Section B still poses the most problems and here students need to be clear about which of the two biological principles they are concentrating on and *must state it*. Section B was very centre specific in that, apart from a minority of centres that had made a good attempt at Ba, the majority of centres had no part of this section as a strength. One centre had taken all their candidates on a visit (e.g. Natural History Museum) and the candidates had been given talks which were later 'written up'. In some centres the talks themselves did not lend themselves well to this section and did not contain enough Biology. Nevertheless, the candidates should have researched the aspect themselves and added it to their report. There were still far too many 'environmental issue' reports, such as global warming, which did not strictly contain **biology** and so gained low marks for this section.

Ba showed no signs of further improvement and many reports are still far too descriptive. The syllabus clearly asks for 'a clear discussion showing a thorough understanding of the biology'. Many reports had plenty of biological information which seemed to have been taken from the sources but not used or discussed. In this case, it is impossible to work out whether the candidate has understood the biology behind the main aspect chosen. Only 3.1% of Visits and 2% of Issues managed to score the maximum 4 marks for Ba. This difficulty with discussion has been highlighted in a review of the SNAB pilot for the Visit / Issue (Dunkerton 2007).

Centres are advised to obtain the DVD called 'Looking at Learning in Science - Talking, Listening and Thinking for a Deeper Science Understanding'. It can be obtained from the DfES Standards Unit.

Although there was a small improvement for Bc, Bb and Bc were still very poorly done overall and remain the most problematic parts of the Visit / Issue report.

Bb - it is essential that candidates give a reasonable amount of detail on their speculations for the future. It is this that actually indicates a good understanding of the main aspect and its implications. It must be their speculations and not those of the scientists described in the main aspect. Interestingly, the lack of improvement in Bb could be due to centres' difficulties in promoting genuine discussion of ideas and concepts that seems to be at the root of Ba's disappointing marks. Approximately half of candidates gained 0 or 1 mark here. The majority of the rest gained 2 for speculating about future developments, but rarely did a candidate use a referenced source here to gain a third mark.

Bc - candidates must identify *at least three* of their sources and then have quite a detailed look at their validity. The best way is to compare the information with that obtained from another source. Many just vaguely said that their sources were reliable without stating which of the sources or giving any *evidence* for their opinion. If the sources are not actually checked, then the 3 or 4 marks will not be given. The majority of candidates from most centres didn't address this marking point at all and gained 1 mark for having three referenced sources numbered in their text. These were usually located in the main aspect text. Where a candidate did not have numbered sources from the bibliography in the text, they rarely scored here as looking at the bibliography alone did not usually reveal three obvious sources for B. They could have been used for the minor aspect instead.

One important point, as for last year, is that candidates must make sure that the Bb and Bc discussions are about the same main aspect that the biology for Ba is. The easiest thing is for candidates to make sure that they identify the main aspect themselves rather than leave it for the examiner to try and work it out.

C - Communication

There was no further improvement on the good scores for Ca and Cb for last year. Students are finding it easier to write for a clearly defined audience and some excellent examples of magazine or newspaper styles were produced using either Word or Microsoft Publisher. Many centres had at least one of these marking points as a strength. However, some did not choose suitable graphs or diagrams to illustrate their point of view and make the report 'a good read' even though it was well presented. Most candidates had put in a bibliography, and the majority had three or complete references plus references in their text. There were still many candidates who had not put references in the text and gained only one mark, and a rather alarming number who had no bibliography at all or it did not contain three 'worthy' references - i.e. it was incomplete.

Still 13% of students failed to identify a target audience and as a result scored zero for Ca, this being the same for both Visits and Issues.

Like last year, 3.5% of candidates not only failed to identify an audience but also failed to identify the two biological aspects for Aa and as a result lost 4 marks. This was far worse for Issues (6.3%) than Visit reports (0.8%).

Although low, still a surprising number contained frequent spelling or grammatical errors and a significant number still failed to include references that had actually been *referred to* in the text. It is essential that as well as including a bibliography, candidates *use* the references in the text e.g. putting a website address next to a picture or diagram used. This then demonstrates that the candidates have read and understood the significance of the work they are referring to. There was a further decrease in the number that only used the SNAB texts as a source of reference material which was very welcome. Candidates must have a bibliography with at least three sources that can be found easily and does not contain a SNAB text as one of them. www.google.co.uk does not count as a source in the bibliography! This was actually quite common again. Endless references to 'Wikipedia' are not acceptable as separate sources either!

General

The standard of 2006 seemed to have been more or less maintained with another welcome increase in the variety of the topics chosen and some excellent, most original work was again produced. A strength for many centres has been the ability to state clearly their two aspects of biology and then deal with them effectively. In addition, another strength was the ability to consider the ethical, environmental, social or economic issues associated with their report.

However, Section B still poses the most problems in that far too many reports tend to be descriptive rather than analytical. Once again, there was a big difference between centres that knew the criteria and those that clearly did not since it seemed that some centres had not read the examiner's report at the end of the year.

There were still too many reports on topics like Global Warming where there was not enough biology to lend itself to a decent discussion. Some centres had been on a trip to the Natural History museum where the talk had been taken verbatim and then 'written up' with hardly any biology for a discussion. For Bb and Bc again, very few candidates gained more than 1 or 2 marks. In fact, in this sample, only 1.1% gained 4 marks for Bb compared to 0.6% last year and 2.7% 4 marks for Bc compared to 0.8% last year. However, the standard deviation for Bc increased from 0.78 last year to 0.97 this year, an indication of the increasing gulf between centres on this component. However, these small improvements for Bb and Bc were very welcome.

At least 20 reports were cases of malpractice where candidates had lifted whole websites or parts of websites and had presented it as their own work. Centres need to be aware that if their students are given a talk and the lecturer has obtained some of the material from the internet, then unless they properly acknowledge this source, a Google search might suggest that the students themselves have obtained this material and presented it as their own! Although cases of suspected malpractice are small in number, centres must remember that they are responsible for their students properly acknowledging source material.

The examining team were almost unanimous in observing that the Visit / Issue report is very centre specific indeed. Some centres have clearly taken previous feedback and reports on board and their candidates were producing excellent work. However, an unacceptably high number do not seem to be reading the specification or understanding its requirements. It cannot be stressed too highly that this is not an essay! It is an original, analytical piece of work.

To do well, candidates must:

- state two aspects of Biology and describe both of them thoroughly;
- consider at least two of social, ethical, economic or environmental issues associated with these two aspects;
- state which is the main aspect;
- describe and discuss the actual Biology associated with this aspect in some detail. Notice that to get the full 4 marks for this they need a 'clear discussion' that shows 'full understanding'. Only 1 or 2 marks are given if it is descriptive and 3 if it is a brief discussion where students do not fully understand the material;
- look at what the future might hold, have a detailed look at the actual methods employed either now or in the future or a combination. Whatever is decided, it must be made obvious and notice that the wording is talking about 'discussion of possible implications'. A simple description or reference to either future developments or uses (methods) will only get one mark. The next three marks will have to be on future developments i.e. 2 marks for speculation, 3 marks for speculation that obviously uses source material and 4 for a full discussion. However, speculation must be from the candidate, not already in the source material;
- give a 'clear evaluation of the relative validity of the information or arguments obtained from three or more sources', not just a passing reference. Again, a simple reference (but at least 3 sources, not including reference to a SNAB book) only gets one mark. A hint of questioning of the 3 sources gets 2 marks, some research into these with the evidence gets three marks and a full investigation gets the 4 marks;
- identify the target audience clearly, make sure the report is matched up to this and use sub-headings and appropriate images to make it interesting and actually a 'good read';
- include a decent bibliography of books or website and refer to things in the text.

Dunkerton, J. (2007): 'Biology outside the classroom: the SNAB Visit / Issue report', *Journal of Biological Education*, 41, 3, 102-106.

6133/02 Unit SN3 Practical Review**Examiners' Report**

Maximum mark 20

Mean mark 12.4

Standard deviation 3.4

General comments

Some of the questions restricted candidates to certain practicals and this meant that it was slightly harder to get the marks this year. However, it must always be appreciated that the week of access to pre-release materials should allow choice of a suitable practical for each question. It was clear that a sensible assessment of which piece of work to choose is not always made. The importance both to have a complete portfolio of work and to make a good choice from it cannot be emphasised enough. For example, in Question 3 nearly half the marks were on safety and thus this should have been the main guiding fact for the choice made, considering that the other parts of the question are possible with just about any of the pieces of work likely to be available. They nearly all involve an hypothesis and the rejection or acceptance of it.

Question 1

Most candidates were able to quote a graph appropriate to the piece of practical work being discussed in (a). The main reason for loss of marks was a failure on the part of some candidates to state clearly which practical was being discussed, making it difficult for the examiner to make a judgement as to whether or not it was appropriate. Misuse of the scatter graph was, as ever, a problem for some. It is suspected that at least some of this comes from the misuse made of this term in MS Excel.

Many achieved a mark for (b)(i), those who did not were mainly the ones who failed to be specific and just talked about how graphs could help in making conclusions. Most candidates knew about error bars, range bars or some variant in (ii) and got this mark.

Question 2

Many candidates missed the key word 'choosing' in (a), despite it being in bold. This often meant the loss of both marks as their whole account related to the treatment of the organism during the practical, and much of this was about stress. For the (roughly) half who did see and interpret the significance of choosing, the marks were quite easily obtained with some discussion about the relative simplicity of the *Daphnia* (or brine shrimp) nervous system, the desirability of using plants or microbes over animals and so forth. By far the great majority of candidates chose the *Daphnia* heart rate practical for this question.

Many were able to define systematic error in (b)(i), although some tried to define it by saying "it was error caused by something wrong with the equipment". In these cases, although no mark was awarded for this, the same candidates would often go on and get a mark for an example from their practical work by discussing a relevant way in which apparatus failings may give rise to systematic error. Human bias in over counting heart rate in *Daphnia*, due to prior knowledge of the experimenter as to which solutions were high caffeine, was allowed. This gave rise to some interesting problems in (ii) though.

Having just discussed, correctly, systematic error in (i) it was worrying now to find candidates saying they could ensure reliability by eliminating it in (ii). So, with the heart rate experiment, there was a lot of discussion of blind testing to get rid of bias. In addition, answers often addressed validity and/or accuracy, by discussing video taping of the *Daphnia* to make rate counting better. Many, however, were able to discuss fair testing, standardisation of procedures and recognising and dealing with anomalies and thus get three marks.

Question 3

In (a)(i), hypotheses must be concise and testable e.g. "A rise in temperature will lead to an increasing rate of reaction for an enzyme". Candidates would not get two marks as it could not be tested without knowing which enzyme and what exactly what was to be measured, in this case probably actually a time for something to happen. The other most common reason for loss of a mark was for the hypothesis to be linked to a long explanation of why it was being proposed.

Many were able to gain one mark here in (a)(ii), as long as the account was specific. The second mark eluded all but the best, though, as it required some supporting data derived from the actual report.

Safety was generally dealt with well in (b), the principle of marking being a precaution, with a reason for taking it and the likely or possible consequences of not doing so. The most common problems were to do with triviality (tying back hair, standing up, tucking bags away etc.) and the perennial difficulty candidates have with explaining why precautions need to be taken with bacteria which are, in theory, actually harmless.

6134 Unit SN4**Examiners' Report**

Maximum mark 60

Mean mark 33.2

Standard deviation 9.5

General comments

The demand of the paper appears to have been similar to previous sessions, though perhaps a little more challenging at the lower end, and the responses of candidates were of a similar range. The majority of candidates had been prepared very well for the paper and there were some excellent scripts, but the vague generalities evident in previous papers were still scoring very few marks.

Although good candidates were not really disadvantaged in terms of marks, it was disappointing to see some prepared answers being produced, rather than answers being tailored to the actual requirements of the question. In particular, descriptions of the immune response and photosynthesis did not always reflect the changed emphasis of this paper, which resulted in considerable wasted effort.

There was no evidence that time had been an issue in the paper, with very few blank spaces, and the quality of written expression was unchanged. It would be helpful if candidates could indicate clearly where they have continued their answer to any particular question outside of the space given, since this was not always obvious.

Question 1

This was a very easy question for many, and very few candidates failed to score most of the marks. The simple list of features of the kingdoms rarely yielded full credit, however, and once again a lack of detailed knowledge proved to be a problem. There was considerable confusion about the difference between prokaryota and protocista, and vague descriptions of characteristics were common. Thankfully, the key was seldom challenging and almost all candidates could give the genus of wood ants.

Question 2

Genetics problems are proving to be well understood, and it is encouraging that they present so few difficulties for the majority of candidates. This question was structured to allow credit for limited understanding, but this was seldom necessary. The main reason for lost marks was poor understanding of what is meant by a genetic diagram. Candidates should be encouraged to show parental genotypes and gametes, even if they are not labelled as such, rather than jot down a table of offspring and leave the examiner to work out where it came from. In this case the question explicitly asked for phenotypes of the offspring, but a significant number of candidates stopped short of this. As usual, it was common for diagrams to show sixteen possible offspring genotypes when one parent could produce just a single type of gamete. This was only penalised by the extra time it must have taken, but hints at limited understanding.

Disappointingly few candidates were able to identify that independent assortment results in combinations of characteristics not found in the parents, although more were able to explain that mutation can result in new alleles rather than new combinations of alleles. Avoidance of inbreeding was most often deemed to be important in captive populations, although full marks were seldom given for the last part of the question as several similar reasons were listed when a full explanation of one reason was required.

The last three parts of this question discriminated well, and only very good candidates scored highly.

Question 3

There was a surprising number of errors in labelling the chloroplast and, although the diagram was rather schematic, detailed knowledge should have made the answers obvious. Most candidates were able to identify photolysis as the source of oxygen in photosynthesis, though some could not offer much beyond the name and there were many who felt it necessary to outline all of the light-dependent reactions. Imprecision was rife, particularly with hydrogen gas being produced rather than ions.

The ability of candidates to deal well with unfamiliar material came to the fore in dealing with the question on photorespiration. The majority spotted an opportunity to show what they understood about the light independent reactions, and they usually scored highly.

It was disappointing to see candidates lose easy marks in the last part of this question by not reading the question carefully enough. Too many candidates gave environmental factors that might affect photosynthesis without explaining how they would increase oxygen production.

Question 4

Descriptions of the graph were generally good, and candidates are learning that quoting comparative data will earn credit whilst restating given values will not. The second part of the question turned out to be rather more difficult. Even very good candidates rarely made reference to the increases in both NPP and GPP as the plants produced more photosynthetic tissue, and there were almost no sensible explanations of the divergence of the two curves.

The equation linking GPP, NPP and respiration was produced accurately by most of the candidates, and the majority of them went on to give some explanation for the final mark.

Question 5

Given the complexity of the immune response, it was most encouraging to read many clear answers to this question. The first mark for the question was obtained by most candidates, and responses describing the prevention of TB were often worth many more marks than were on offer. Although verbose answers were given full credit, it would be useful for candidates to limit their response to the specific requirements of the question, rather than give a comprehensive account of the whole process.

The problems of HIV infection were too often much too imprecise, with descriptions of the immune system being weakened or damaged being very common. The specific effect of T-helper cell loss should be familiar at this level. Similarly, candidates all too frequently resorted to general symptoms of some generic illness when they were unable to recall the symptoms of TB. Such answers will not gain credit.

Question 6

This question provided an opportunity for many candidates to show that they can write clearly when describing a process that they understand well. There were very many good answers and the question scored highly in general. Although the second part was also done fairly well, there was some evidence that candidates were not paying full attention to the command words and chose to explain why a fever was of benefit during an infection.

Question 7

The first question had not been asked before, and it was obvious that very few candidates had any idea of what was required. The most common answer was the total number of organisms carrying an allele. Descriptions of natural selection carried their usual range of misconceptions, although simple statements about survival of the fittest seemed rather less common and fewer candidates seem to have been influenced by Lamarck. Survival of individuals without reference to reproduction or the effect on future generations was very common and limited the marks available. Answers to the final question were often very pleasing and showed clear understanding.

6135/01 Unit SN5 Written test**Examiners' Report**

Maximum mark 40

Mean mark 20.0

Standard deviation 8.6

General comments

The paper provided a full range of marks from 0 to 40. Candidates were able to access most of the questions and some acted as good discriminators. There was clear evidence that candidates could provide good, logical descriptions of a series of events (e.g. in the muscle fibre question). As with previous papers those parts of the questions which required candidates to apply their scientific knowledge proved to be more discriminating. It was evident from the answers to some parts that candidates were not reading the questions carefully.

Question 1

The vast majority answered (a) well. Part (b) was generally well answered, but a large proportion of candidates failed to address the directionality of the question. Respiration and carbon dioxide were often mentioned but not qualified by an increase. Marks were also lost for not stating that changes happened in the blood. Many named the sympathetic nerve but referred to the impulse or an impulse rather than an increase in the frequency of impulses. At A2 this would be expected.

Question 2

This question proved to be discriminatory. There were many vague descriptive accounts which were not supported by appropriate scientific rigour.

In (a), those candidates who linked the detail of the experiment with the correct scientific terminology scored well. A surprising number of candidates reiterated part of the stem as the answer. In (b), the majority scored 1 mark (mark point 2) often giving both the reward and the punishment side of the conditioning. Few gained mark points 1 or 3. There were many generalised answers to (c) which did not gain marks. The question referred to the study of learning in animals but it was very rare for candidates to refer to *Aplysia* or chimpanzee studies. Candidates were often using the term animal instead of mammal, stating that animal and human brains have similar structures. Many candidates made no reference to learning in their answers. In (d), most candidates were aware that fMRI shows which parts of the brain are active and some mentioned rapid image production or 3D imaging. Only the very good candidates could give accurate descriptions of the effects of oxyhaemoglobin and deoxyhaemoglobin on radio wave signals.

Question 3

Part (a) was generally answered well and candidates who had learned the sequence of events often scored the marks quickly. There was evidence of confusion about the role of ATP in both the movement and detachment of the myosin head. Part (b) proved to be challenging for many candidates. Despite the stem stating that the effects were at the synapses many gave answers relating to muscle contraction. Good candidates gave clear descriptions which linked the events with pre- or post-synaptic membrane as appropriate. Surprisingly few candidates said that bungarotoxin might have a similar shape to the neurotransmitter.

Question 4

Good candidates scored well on this question. Those who did focused on A2 Biology, using detailed knowledge and understanding and giving examples from all three parts of the answer. Many candidates gave vague descriptive answers with common names rather than scientific ones e.g. wear and tear on the kneecap which are not creditworthy at this level. Immune suppression was well understood and explained by many candidates. As this is an A2 paper some candidates who went into detail from an AS topic lost marks as they did not address the scope of this question.

Question 5

Although (a)(i) often scored well, marks were lost by many candidates who did not take care with the detail. A majority of candidates referred to an impulse rather than impulses for both mark points 2 and 5. Few candidates started with photoreceptors and a significant minority lost marks for descriptions of the breakdown of rhodopsin. In (a)(ii), many candidates scored one or two with only very good candidates getting all three marks. Most understood that the impulses were faster but few qualified insulation with electrical. Frequent mention was made of the nodes of Ranvier but few stated that this was the only place where depolarisation occurs. Almost all the candidates referred to 'critical window' in (b), but many then lost marks by using vague terminology instead of describing the process of growth of axons or formation of synapses during this time. Surprisingly few candidates mentioned that visual stimulation is essential. It was refreshing that only few candidates used (c) as a platform to express personal views thereby losing marks. Many candidates correctly named and explained utilitarian philosophy. A good example allowed many to get mark point 3. Some candidates did not state that the expected benefits were greater than the harms.

6135/02 Unit SN5 Coursework**Examiners' Report**

Maximum mark 40

Mean mark 27.6

Standard deviation 6.4

General comments

The Moderators were pleased to see a wide variety of individual investigations were carried out. As was the case last year many of the best investigations stemmed from candidates' individual ideas rather than formulaic investigations such as variations on the theme of sheltered versus exposed shore investigations. If candidates do not have the opportunity to be genuinely individual in their research and development they are not being allowed to follow the SNAB approach to Biology A level.

There are still instances of candidates having worked quite hard on data capture and processing yet failing to address some aspects of the criteria. If these omissions were not reflected in the Centre marking then the Moderators had to reduce the marks awarded. Teachers in some Centres submitted carefully considered comments for each section of the electronic record sheet, greatly assisting the moderation process. **This is especially important when larger Centres are submitting work marked by more than one teacher, where there should be some evidence that internal moderation has taken place.**

It was pleasing to see that many Centres provided thoughtful and helpful comments to support their awarding of marks. This is very important aspect of the teacher marking and helps the moderators treat each Centre fairly. There are still a minority of Centres submitting only very brief comments or none whatsoever. Whilst the Moderators treat every candidate's work as fairly as possible it is continued concern that, at times, there is no recorded justification for the marks awarded by the Centre.

A Research and rationale

Generally the candidates gave more emphasis to this section than last year and future candidates should be encouraged to pay careful attention to this opening section: good research before work begins improves the quality of the whole investigation.

As was the case last year, many candidates stated an aim or hypothesis and gave some biological background; although they must have used sources they were often not referenced in the text. Many candidates seemed content with only three or four sources, one of which was a SNAB textbook. Candidates are expected to spend some time finding good sources if they are to be awarded higher marks for this section. Unless some sources are incorporated into the conclusion, Ab cannot be given more than 4 marks. A significant number of candidates failed to place their investigation into a context or explain their interest in doing the work.

B Planning

The plan was usually given its own subsection and the variables were clearly measured or controlled. Trial experiments were carried out by most candidates and they often led to useful changes to the plan. This allowed Centres to give candidates higher marks as a consequence.

The Moderators were pleased to see that only a very small number of candidates claimed a core practical from the previous year or a different type of group ecological study as a trial experiment. The moderators did not regard this as meeting the criteria.

At least some potential safety hazards were identified by nearly all candidates. The best examples were set out in a table and all reasonable risks considered. Laboratory based experiments should be encouraged to use Hazcard data. This aspect could have easily been improved by many candidates.

C Implementing

Candidates were usually able to carry out techniques carefully and methodically. Candidates often stated that they had reviewed their plan in the light of their trial experiment and either made modifications or confirmed their original plan did not need any modification. To justify the award of high marks there must be further written evidence of review as the data collection proceeds.

D Observing and recording

Many candidates collected sufficient data with repeats to allow meaningful interpretations to be made. However it seemed to the Moderators that many candidates had not given any thought to the possibility of anomalous results, or perhaps these results were overlooked. If anomalous results were noted they were often not discussed or investigated. When these details are missing from a report the higher marks for strand b cannot be justified.

E Interpreting and evaluating

Very few candidates had major problems with statistical analysis. However statements about confidence limits and the justification for accepting or rejecting a hypothesis sometimes lacked clarity. Biological principles were still often only referred to in a superficial manner to interpret the results as was the case last year. The Moderators are still concerned that a greater emphasis needs to be placed on using biological principles to interpret the findings of the investigation.

Some graphs were inappropriate for the data gathered and this did not help the candidates consider the biological principles involved.

The limitations were often carefully discussed although sometimes modifications were not considered or suggested.

F Communicating

As was the case last year, there were many excellent reports that used suitable images, graphs, tables and diagrams. An abstract is not strictly required but it does lend weight to scientific style. Many of the best reports were significantly less than 3000 words. A small number of reports were well beyond the word limit but the candidates had thought the penalty worth taking as all the other sections were worth high marks.

Some otherwise good reports did not present well chosen graphs or a properly constructed bibliography. This latter point has been less of a problem this year: web site details are given in full, ideally with date accessed. However, details of books used were often incomplete; including the SNAB books! The author(s), title, date, edition and publisher (ISBN) should be given.

Most candidates used sources of information when writing their reports. Unfortunately these sources were often not referenced in the text. This can be done by several methods: if it is not, then 6 marks cannot be awarded for this section.

Overall, many candidates made a genuine attempt to carry out an individual investigation at GCE standard, their marks were usually limited more by omissions rather than by failing to carry out suitable investigations. The Centre marking was well matched to most of the criteria.

The Moderators hope that the comments in this report will be brought to the attention of future candidates.

6136 Unit SN6 Synoptic paper**Examiners' Report**

Maximum mark 60

Mean mark 31.5

Standard deviation 8.2

General comments

The examiners were once again pleased with the quality of many candidates' responses to this synoptic paper, which demonstrates the high standards of application and understanding of Biology that many candidates and centres are now reaching. The mean mark and range of marks is almost identical to last year's paper. Each individual question achieved the full range of marks with a good spread of easily accessible marks and some challenging points for the more able candidates. The examiners are satisfied that this paper manages to assess a range of intellectual skills and abilities drawing on information which could be taken from every unit of the A level specification.

Many centres had prepared their candidates well for the demands of the exam, particularly the comprehension questions and the essay. The level of understanding shown by many candidates during this paper demonstrates that many candidates have developed good skills of analysis and communication together with a sound understanding of many Biological concepts of importance. However, a significant number of candidates still appear to tackle the paper with the attitude that quantity rather than quality is what matters, as they spend lot of time writing down excessive volumes of information not asked for by the question. This hit several candidates' marks for the essays in particular and also resulted in a lot of candidates using extra answer sheets that should not be necessary when tackling each question. Candidates should be reminded that the exam is now marked online and they should therefore keep their answers clearly within the allocated space for the response and not write in the margins or into the next question space, particularly if they have not clearly indicated that their answer continues elsewhere on the examination paper. The whole examining team would like to remind candidates to write clearly so that their answers are easy to read and decipher.

Question 1

Generally most candidates demonstrated a strong knowledge and understanding of the article, but their ability to use and recall information from the rest of the specification that relates to topics covered in the article was more variable. Candidates should be reminded that this synoptic paper can draw on the content of the whole biology specification so they should certainly revise topics that are related to the science covered by the article in their preparation for this exam.

1a) Most candidates were able to suggest a genetic link, and some commented on the contribution of another risk factor. A minority of candidates used the article to give a named example. Not enough candidates appreciated that inheritance of a gene does not mean that you will develop the disease.

1b) Most candidates managed to recognise that polygenic referred to many genes being involved, although some confused it with multiple alleles, or multifactorial involving many environmental factors.

1c) Many candidates took up most of the space writing: 'pygmies don't reach an age to get Alzheimer's & that French do.....' (giving reasons). Few candidates actually wrote that Alzheimer's affects the old. Few candidates wrote that 'one copy of APOE ϵ 4 increases risk in French people'. It was worrying that several candidates implied that pygmies are not human!

1d) Most candidates could get the mark but others often made a mistake e.g. elimination of disease, changes in diet etc - often with no reference to the article (which they were explicitly asked to do).

1e) It was common for candidates to use much of their space just repeating the question, describing the longer lives rather than answering the question. However, most candidates managed to score 2 or 3 either for quoting the relevant information about gene switching, or by reference to less reproduction. Although some candidates wrote about lack of disease, cancer etc they did not explain why. Good candidates often demonstrated an understanding about why less reproduction and an enhanced immune system can increase life expectancy.

1f) A few candidates did not attempt this question so must have perceived it as too difficult, implying that they really were not familiar with the article. Some just wrote about how superoxide dismutase protects against free radicals and a few wrote about animals and humans as if humans are not animals! Most candidates tended to pick up a couple of marks easily for referring to Down's and ALS, whereas better candidates often explained why SOD can cause damage to motor neurones.

1gi) There was a clear distinction between candidates who had detailed knowledge of the stages of genetic screening and scored very highly, and those who did not. A significant number of candidates gained full marks with clear and correctly sequenced descriptions, using scientific vocabulary with confidence. A minority of candidates misunderstood the question and confined their answer to discussing the genetic basis of the disease rather than how it would be tested. Several candidates just described watching for dementia and ignored the possibility of a definitive test. Others relied on brain scans or thought that sending the DNA away for analysis would be a sufficient description of the technique. Several candidates focussed on describing the PCR technique to obtain enough DNA rather than the screening of the DNA itself. Candidates did not always express themselves well, especially when explaining the use of gene probes and how disclosure is achieved through the use of labelling. Few candidates referred to counselling.

1gii) Most candidates picked up the disadvantage mark - most by mentioning insurance, stress or choosing to have children. For the advantage section, many simply stated 'so they could prepare'. More worryingly, many candidates think that Huntington's is a disease that can be prevented by taking drugs or eating healthier food, and didn't understand the inevitability of it- confusing it with CVD mentioned earlier in the questions. Good candidates often considered issues to do with the family and how you could try using IVF etc to prevent passing on the disease, or that it may prevent couples having children. Few candidates considered the effect of having an all clear result.

Question 2

2ai) About half of the responses scored 1 or 2 marks only for 'lack of oxygen' and / or 'anaerobic respiration'. These candidates were unable to go on and explain any of the biochemical details underlying lactate production. The remaining candidates scored highly, with a clear explanation. Some responses were outstanding, demonstrating a detailed understanding of the processes involved.

2aii) This question was answered poorly. A minority of candidates understood the meaning of statistical significance, demonstrating a mechanical usage of the statistic to reject or accept a hypothesis without knowing why. The majority of candidates interpreted significant as meaning 'important' or 'large' rather than referring to a statistical significance and that results may occur simply due to chance. References to p meaning pressure, 5% difference in results or 0.05% were also common when attempted.

2aiii) Poor responses commonly just described that lactate concentration increases with time due to anaerobic respiration, ignoring the actual pattern in the data. Several described a dip in lactate at higher dive durations ignoring the variation in the data provided and then tried to explain the dip. A few good responses recognised that there was little change until 6 min when anaerobic respiration will become involved and start to build up lactate. Candidates need to look at all of the information contained in a graph carefully when examining 'real' data.

2b) The basic link between heart rate and depth of diving was generally identified except by weak candidates. Where this was not done the answers suggested that candidates had not read the axes of the graphs correctly. Once the link was made, figures were often provided and, again, weaker candidates had these the wrong way around suggesting that the heart rate increased with increasing depth. There were a few instances of poor use of language referring to 'higher depth' or other similar comments. The reasons for decreasing the heart rate when diving were explained well by the better candidates, although some candidates thought that diving would use less energy than resting at the surface.

2ci) PQRS or T were the most common incorrect answers for naming the part of the ECG trace. X was also often named systole or diastole or no name provided. Some candidates were unclear about what ventricular systole is, contradicting themselves by writing that it was the atria contracting or the ventricles relaxing.

2cii) many candidates did not attempt the calculation of heart rate; others forgot to include the units in their answers. Candidates should be reminded to check that their calculations yield a biologically realistic heart rate for the context of the question.

2di) This question was often poorly answered with several candidates spending time describing how to cool the body down at 35°C (including by sweating and how 35°C is a big shock to the system and above body temperature!) rather than recognising that 25°C is more different to the core temperature than 35°C so may use vasoconstriction to conserve heat energy.

2dii) This question was answered well, with 'nervous' and 'adrenaline' being the most common responses. Some candidates made good references to the sympathetic nervous system.

The Essays

There was a very even split of choice of essay this year (52% question 3 and 48% question 4) and both essays had a full spread of marks. A few centres have expressed concern that the essays were 'narrower' than in previous years and were grounded principally in AS topics. This is true to the extent that both essay titles had to be equivalent to each other, but the expectations were that candidates would draw on their knowledge and understanding of both AS and A2 topics to revisit and explain these well known and contemporary issues in biological science. The responses marked certainly demonstrated that the vast majority of candidates had no difficulty tackling at least one of the essay choices and most wrote at significant length on their chosen theme.

The essay mark scheme retained the discriminatory and hierarchical style introduced last year while retaining the original balance of marks between relevance, depth, accuracy, synopticity and communication skills.

A marks are now awarded for introducing a key area of the topic, but specific technical terms are not needed at this level. **B** marks are awarded for specific points of biological detail. **C** marks are awarded for identifying key intellectual arguments and implications often extending from a group of **B** points.

There are therefore effectively three levels of synopticity accessible by candidates which could be interpreted as the following questions:

A: Can you select the range of topics to mention in the essay?

Most candidates were good at this for both essays, even the weakest responses picked up several **A** marks.

B: Can you develop some of these ideas with some relevant depth?

This produced a wide range of marks with many candidates struggling to demonstrate sufficient depth of knowledge to gain credit.

C: Can you stand back, be slightly philosophical, see the bigger picture and think about the slightly strange wording of the question and see if you can discover what it's getting at?

This section received the lowest number of marks, although some candidates did make excellent considerations of some of these points for both essays.

D marks: most candidates were able to operate at the level of 2 marks - but not many were able to weave ideas together in a seamless way. Many of the better candidates were getting 3 but only a few scored 4.

There is still a potential total of 24 points available (for a maximum mark of 20), but this year we gave very few essay marks of 20 - the better candidates were getting 18, because of failing to meet many of the expected **C** points.

Unfortunately several candidates used the general topic area to rush into answering a question of their own choice rather than answering the question asked, leading to a lot of irrelevant and misleading material being included. This was more of a problem for Question 4 rather than Question 3 often resulting in lower marks being scored for question 4 than question 3.

Question 3

Many candidates answered this question confidently providing a good level of breadth. Better candidates were able to give biological details which obtained marks for depth; some candidates gave outstanding balanced essays. Most candidates were able to define a stem cell at a basic level and state the source of embryonic stem cells. Fewer were able to use the terms 'totipotent' etc correctly (omnipotent was sometimes used!) or give further details about how stem cells are produced. Not all candidates discussed other sources of stem cells or alternatives to the use of stem cells. Few recognised that adult stem cells may need to be reprogrammed if they are to be used to generate other tissues.

Most were able to identify therapeutic cloning as a potential use, although details of techniques involved in cloning or manipulating stem cells were often sketchy or confused. A substantial number of responses still considered rejection of stem cell organs as a problem, rather than a significant potential advantage.

Most responses considered ethical issues, mainly pro-life arguments. Fewer candidates discussed the dangers. Some candidates expressed very strong views, in both directions, almost at the expense of the biology.

Poor candidates spent most of their time describing issues such as cloning Dolly and genetically modified crops rather than exploring the biology and issues of stem cells and their applications; whereas good candidates defined stem cells clearly and the different sources and applications, together with some specific discussion of ethical issues around the rights of the embryo and designer babies. Many related the use of stem cells to a lack of rejection, but disappointingly few went into describing anything to do with the immune system. Relatively few C marks were awarded but there was often some very good discussion about these points, such as recognition that it may not be ethical to exploit embryos but it is also not ethical to prevent the development of new therapies to alleviate human suffering.

Question 4

This essay brought about a wider range of responses from some extremely good synoptic essays recognising and describing a wide range of biological processes potentially influenced by climate change to responses which were often confused and irrelevant. A careful reading of the question, identifying main points, would have produced significantly better responses for some candidates.

Poor candidates ignored agricultural effects entirely despite being in the question and focussed on a vague description of some of the issues raised in 'An Inconvenient Truth' such as polar bears struggling due to the arctic ice melting. An alarming number of candidates link CO₂ to holes in the ozone layer and skin cancer or describe the hole in the ozone layer as being the cause of global warming. Many candidates are clearly still mixing up the greenhouse effect, the ozone layer and acid rain. Many described adaptation of animals without explaining a mechanism. Some candidates took this essay as an opportunity to write everything they could remember about photosynthesis, respiration and skin cancer. Alarming many candidates spent a lot of time describing how global warming would cause humans to become ill and die because our enzymes would denature, ignoring our ability to thermoregulate covered in A2 topics 6 and 7. Most responses correctly identified rising sea levels as a consequence of global warming and suggested migration or extinction as possible outcomes. Fewer candidates were able to give specific examples or detailed explanations of these often ignoring the biology involved.

Good candidates had a good awareness of the effects on specific populations and habitats often well described with good examples. They also recognised the effects of migration and natural selection and evolution as ways to adapt to changing climates, including concerns over the possibility that the rate of climate change may be too big for natural populations to change quickly enough to cope. The wide range of issues was often supported with some good Biology so several B marks would be awarded and a few C marks for good candidates. There were a few excellent discursive essays which clearly described and weighed the evidence about the potential biological effects.

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 on the next page 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 on the previous page.

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	44	38	32	26	21
6133 Unit SN3	40	29	25	22	19	16
<i>Paper 01 Visit/Issue Report</i>	20	15	12	10	8	6
<i>Paper 02 Practical Review</i>	20	14	13	12	11	10
6134 Unit SN4	60	43	38	33	29	25
6136 Unit SN6	60	39	35	31	27	24

Unit	Maximum mark	Grade				
		A	B	C	D	E
	<i>Uniform marks</i>					
	120	96	84	72	60	48
	<i>Raw marks</i>					
6132 Unit SN2	70	40	36	32	28	24
6135 Unit SN5	80	61	54	47	41	35
<i>Paper 01 Written test</i>	40	27	23	20	17	14
<i>Paper 02 Coursework</i>	40	34	30	27	24	21

PROVISIONAL STATISTICS

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

Unit	Entry	Cumulative percentage of candidates				
		A	B	C	D	E
6131 Unit SN1	4 252	19.6	32.5	46.8	62.0	74.6
6132 Unit SN2	6 958	21.6	34.3	47.6	60.5	72.8
6133 Unit SN3	6 448	15.4	39.0	60.1	77.3	88.2
6134 Unit SN4	1 735	17.7	36.5	53.7	67.0	80.4
6135 Unit SN5	2 699	18.2	35.1	52.3	66.0	78.5
6136 Unit SN6	2 694	20.8	36.6	54.6	72.7	82.5

AS cash in	Entry	A	B	C	D	E
8048	5 149	16.8	33.6	51.0	68.1	83.8
9048	2 689	18.8	40.8	63.6	81.7	94.1

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 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
Unit 1	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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