



GCE EXAMINERS' REPORTS

**BIOLOGY / HUMAN BIOLOGY
AS/Advanced**

SUMMER 2012

Statistical Information

The Examiner's Report may refer in general terms to statistical outcomes. Statistical information on candidates' performances in all examination components (whether internally or externally assessed) is provided when results are issued.

Annual Statistical Report

The annual Statistical Report (issued in the second half of the Autumn Term) gives overall outcomes of all examinations administered by WJEC.

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BIOLOGY / HUMAN BIOLOGY
General Certificate of Education
Summer 2012
Advanced Subsidiary/Advanced

Principal Examiner: Mr B Hughes

Unit Statistics

The following statistics include all candidates entered for the unit, whether or not they 'cashed in' for an award. The attention of centres is drawn to the fact that the statistics listed should be viewed strictly within the context of this unit and that differences will undoubtedly occur between one year and the next and also between subjects in the same year.

Unit	Entry	Max Mark	Mean Mark
BY1	4328	70	44.1

Grade Ranges

A	54
B	49
C	45
D	41
E	37

N.B. The marks given above are raw marks and not uniform marks.

BY1

General Comments

The paper allowed all candidates to access marks.

The quality of written communication was again an issue for some candidates. They were reminded of the necessity for good English and orderly presentation on the front of the examination paper, but a significant number lost marks because examiners could not make sense of what had been written.

- Q.1 A substantial majority of candidates were awarded both marks for part (a). In part (a) (i) some candidates gave the incorrect answer 'indicator'. In part (a) (ii) the most common error was 'organ'. In parts (b) (i) and (b) (ii) some candidates failed to make a comparison, describing one cell type or organelle only but not indicating which they were describing. Advice to candidates should be to comment on both items when comparisons are required.
- Q.2 This question was generally well answered with most candidates scoring a majority of the marks. There was some guesswork in part (a) with OH groups the wrong way up, and some not attempted. Similarly in part (b) (i) some alpha and beta the wrong way round and some not attempted. Part (b) (ii) was generally well answered. Some candidates went to town and could have been answering a 10 mark question.
- Q.3 This question was also well answered by most candidates. Part (a) (i) has been asked many times before but some candidates still gave incorrect responses including 'nucleic acid' and even 'DNA'. Correct spellings were required for part (iv); candidates should be advised that they must be able to spell the names of the bases. In part (b) poor quality of written communication hindered some candidates; also some candidates confuse the double helix with the alpha helix. In part (c) candidates are required to describe the function i.e. make the link between base sequence and amino acid sequence some gave a vague answer like 'contains genetic information' which is not a description.
- Q.4 In this question candidates were required to apply knowledge to an unfamiliar situation. In part (a) most candidates were able to draw two structures A in the female cell and one in the male cell. However, many were confused and split the chromosome into chromatids, a number of incorrect permutations of chromosomes and chromatids were then drawn. A small number attempted to draw 46 chromosomes. A wide range of responses was seen in part (b) included some unlabelled drawings and some that were so poorly drawn they were impossible to interpret. The most common error in part (b) (i) was to draw the wrong number of chromosomes, candidates who carried this error forward to (b) (ii) were awarded the mark. Many candidates gave growth as an answer to (b) (iii) even though the stem of the question eliminated that answer. Candidates needed to link the production of genetically identical cells for replacing cells to get both marks. Part (b) (iv) required higher order thinking, fewer candidates appreciated that because the cells are already haploid, and mitosis produces haploid cells for gametes. Part (b) (v) correct spelling of meiosis is required; candidates should be advised that they will always be required to spell mitosis and meiosis correctly. Candidates should know the significance of meiosis, part (b) (iv) is merely another way of asking the question which seems to have thrown many candidates. In part (c) candidates were required to link the information in the stem of the part to the information given right at the start of the question. Candidates should be advised of the importance of reading the whole of the question.

- Q.5 Most candidates were able to complete the diagram in part (a) (i) however some did not gain all three marks, often omitting to show the formation of a water molecule or by not indicating which atoms would be removed. The great majority of candidates correctly named the condensation reaction in part (a) (ii) and the peptide bond, in part (a) (iii) though we did, fairly regularly, see 'hydrolysis' and 'glycosidic' respectively. Some candidates struggled with their quality of written communication in part (b) (i) failing to show that they understood which components were moving or forming the mosaic affect. The great majority of candidates correctly identified B as forming an extrinsic protein in part (b) (ii), though there were some poor quality drawings in part (b) (iii). Also, there seems to be confusion about what constitutes an extrinsic protein, and the importance of the positioning of the polar and non-polar groups in determining the positioning of the protein in the membrane was often either poorly shown or omitted from the diagrams altogether. The majority of candidates knew one function of the carbohydrate chains in part (b) (iv) but too often candidates described it acting as 'a store of energy'. Parts (c) and (d) were well answered with the majority giving correct responses.
- Q.6 In this question candidates were required to demonstrate that they were able to make a sophisticated analysis of the results of an experiment. In part (a) (i) many candidates were not awarded this mark because they failed to state units. Candidates should be advised that they will always be required to give units in their answers to calculations, unless the unit forms part of the wording of the question. For part (b) (ii) the candidates merely had to read the value from the table. Many candidates omitted the minus sign and a few did some kind of calculation on the value to give an incorrect answer. In part (b) quality of written communication was again the main problem. Often communication was so poor that it was impossible to tell which step in the experiment was being described. Many candidates did not understand that they needed to explain what was happening at step 2, when the beetroot cells were immersed, and instead described osmosis occurring between the drop that was released and the solution into which it had been released. An alarming number of candidates were not able to handle negative numbers in order to solve the simple equation in part (c) correctly. There was great variation in the quality of drawings in part (d) (i). Candidates should be advised that their drawings are interpreted according to the labels they apply. Markers are not permitted to interpret drawings as if they had been correctly labelled where candidates have given incorrect labels.
- Q.7 Option 7(a) was the less popular choice, with only very few candidates attempting it. A range of marks were awarded, but those candidates who gained fewer than the full 10 marks had clearly not prepared properly and gave very weak answers. Option 7(b) was attempted by the vast majority of candidates and most of those who did attempt it gained the maximum 10 marks. (Many could have been awarded all of the available 15). The quality of written communication was an issue for a small number of candidates and some had clearly not prepared themselves properly because they did not present any details.

BIOLOGY / HUMAN BIOLOGY
General Certificate of Education
Summer 2012
Advanced Subsidiary/Advanced

Principal Examiner: Ms F. Cowie

Unit Statistics

The following statistics include all candidates entered for the unit, whether or not they 'cashed in' for an award. The attention of centres is drawn to the fact that the statistics listed should be viewed strictly within the context of this unit and that differences will undoubtedly occur between one year and the next and also between subjects in the same year.

Unit	Entry	Max Mark	Mean Mark
BY2	6857	70	39.3

Grade Ranges

A	52
B	47
C	42
D	38
E	34

N.B. The marks given above are raw marks and not uniform marks.

BY2

General Comments

There was a range of standards seen in scripts, verging from superb papers with almost full marks to poorer offerings with fewer than 10 marks out of 70. Those who knew and understood the work routinely scored full marks. These scripts were a pleasure to mark.

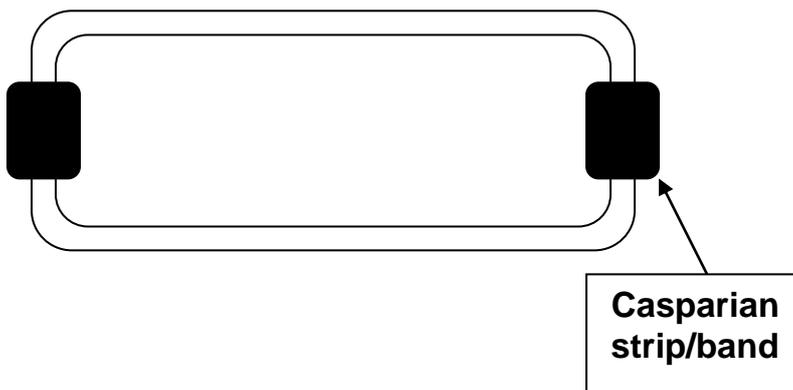
Many are still not learning basic facts, for whatever reason, and many are trying to learn them rote fashion and do not understand the logic behind what they have learnt. The result of this is that any kind of application of knowledge question is poorly answered. There was much confusion with epithelium, endothelium, epidermis, endodermis throughout the paper.

- Q.1 This was clearly an easy question for the majority, with all marks being gained by almost all candidates. The most common mistake was to confuse prokaryotes and protocista and the spelling was sometimes difficult to decipher, although phonetic spelling was allowed.
- Q.2 (a) Was largely well done, although there was some confusion in b) with some candidates getting the artery and vein the wrong way round. Weaker scripts did not attempt to identify the name of the blood vessels connecting to the heart and simply put artery and vein.
- (b) Most candidates identified the large number of capillaries and large surface area due to folding. Weaker responses just stated 'thin' or 'thin membrane', rather than describing the thinness of the alveolar walls.
- (c) They had either learned it or they hadn't, but weaker answers generally got entirely mixed up with volumes and pressures or the sequence was completely wrong, often implying that breathing-in instigated the increase in volume of the thorax and decrease in pressure.
- Q.3 Parasite was routinely defined correctly, but autotroph and saprobiont less frequently so. The autotroph definition was often sloppily worded and saprobionts were frequently confused with mutualistic relationships.
- Q.4 (a) This question was a good test of the understanding of heart structure and there were many who gained full marks. They clearly took their time over the question, often drawing out the more common anterior view diagram with which to work. They transposed the valve labelling correctly and were duly awarded credit. Although the question asked for the valves to be identified, many chose to label heart chambers or blood vessels.
- (b) This was generally poor. Many responses showed no analysis of the diagram and were talking about pulmonary arteries/veins (despite the veins actually being identified on the drawing), capillaries and just about any named blood vessel.
- (c) This part of the question was generally well done. However the position of the valve was often confused which meant that many in (ii) stated that blood would flow back into the heart rather than back into the left atrium.
- Q.5. This question was generally well done. Candidates had learnt the work and were able to recall it correctly. Better responses gained all 8 marks. Most marks were lost in c) where many got carried away with a detailed description of counter-current flow (often including diagrams), but forgot to mention any kind of ventilation mechanism or that the flow of water is unidirectional.

- Q.6 Surprisingly this appears to be the worst question on the paper. This is a simple 'bread and butter' diagram, but very few could label all three structures in a) correctly. Confusion over epithelium was common and very few could identify a lacteal.
- (b) Was correctly identified in better scripts.
 - (c) Again only gained full marks in the very best scripts. This is a common question and yet it was poorly done by many.
 - (d) Very few answers could correctly identify a goblet cell and the production of mucus. Again a very common question, but this was poorly done by the majority.

Q.7 Question 7 showed that many candidates, although they have learned plant histology, have difficulty linking it together to make a coherent story as far as whole-plant physiology is concerned.

- (a)
 - (i) Was generally well done by those who took time to look at the photograph, but there was a tendency to just trot out all the xerophytic features of Marram Grass without reference to the photo.
 - (ii) This was often given as 'because it reduces transpiration', which is insufficient as an explanation. Frequently there was no way of knowing which of the features they were referring to in the answer.
- (c) Both (i) and (ii) were very well answered by almost all candidates, however there was then an entire range of names given to cell C, the most common being root hair cell. Clearly although candidates recognise the structure of xylem and phloem within the stele, they are not able to identify the endodermis.
- (iv) Was very poor, even by those who knew that cell C was endodermis. This was really surprising, since all that was required was a simple:



Other diagrams were given credit, including 3-D diagrams, but this is such a standard question that it is hard to understand why this was so poor in many scripts.

- (v) This was generally well done by those who had learned the work.
- Q.8
- (a) This was probably the most popular essay and often gained full marks; their essay was based on solid knowledge and was well presented in a coherent manner. Some marks were lost in the second part of the essay since it asks for success related to reproductive strategies, not nutrients cycling and other non-reproductive features. As might be expected some weaker responses turned the question into an internal/external fertilisation question and therefore forfeited many marks.
 - (b) This was less frequently attempted, but those that did so often gained all marks available – it is, after all, a simple question if you know the facts. Use of the potometer was also well described with some superb descriptions of the experimental work.

BIOLOGY / HUMAN BIOLOGY
General Certificate of Education
Summer 2012
Advanced Subsidiary/Advanced

Principal Examiner: Mr P. Owen

Unit Statistics

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Unit	Entry	Max Mark	Mean Mark
HB2	1172	70	37.8

Grade Ranges

A	52
B	46
C	40
D	35
E	30

N.B. The marks given above are raw marks and not uniform marks.

HB2

General Comments

Many candidates experience problems in providing full and detailed answers to questions and in particular, in using the appropriate biological terminology.

- Q.1 Although this was intended to be a relatively simple introduction to the paper, many candidates had problems, particularly with the type of reaction involved with many describing it as a condensation reaction. It was pleasing to see that the majority of candidates ensured that they clearly wrote maltose or maltase, as appropriate and left no grounds for confusion.
- Q.2 Whilst many candidates could comment on the fact that an antigen caused the production of antibodies, far fewer gave any further detail. Many candidates had little idea of the mechanisms involved in antibody production. There were often vague references to lymphocytes however, only a minority of candidates gave the full details of B lymphocytes cloning and giving rise to plasma cells which produced the antibodies. Candidates often failed to describe the specific nature of the response and the role of specific binding sites. The answers to part (c)(i) usually scored well with most candidates recognising that the level of antibody produced was greater in the second response and that there was a shorter latent period or more rapid production. The answers to part (c)(ii) usually recognised that memory cells were produced as a result of the first injection but often then went on to say that it was they who produced antibody, rather than describing how it was the memory cells that gave rise to the plasma cells more rapidly, which in turn produce antibody.
- Q.3 Candidates nearly always correctly identified A as alveoli but failed to correctly identify fully structure C. Many simply referred to C as epithelial cells rather than ciliated epithelial cells. Most candidates recognised that the role of C was to provide a large surface area but simply qualified that answer by saying 'for gaseous exchange' rather than specifying that it would generate more or, increase gaseous exchange or oxygen uptake. Candidates must learn to spell out what they mean. Few candidates could describe the function of B with many stating that it was to 'prevent the lungs from collapsing'. Where a candidate did appreciate that it was to prevent the bronchi/bronchioles from collapsing few could go on to explain that, without the cartilage, this was a possibility during the pressure changes brought about during breathing. In answer to part (b)(i) most candidates recognised breathlessness or wheezing as a symptom but, few mentioned the resulting fatigue or incapacity that would result from the breathlessness. The descriptions of the appearance of structure A, left many candidates struggling to express themselves with clarity. Many were able to comment correctly on the reduction of surface area but couldn't express themselves adequately to describe the walls breaking down or the alveoli coalescing. The drawing of the trace very rarely yielded full marks. Many candidates scored one mark for suggesting that the tidal volume would be much less but then, were unable to suggest a trace for someone who had difficulty in breathing out, which is a symptom of the disease. Two variables that were given often included reference to rest or same level of activity which are not appropriate for this particular investigation. The obvious ones of age, sex and weight were very infrequently given.

- Q.4 Few candidates could give an appropriate explanation of the Bohr Shift and often, the only mark awarded was for the name, or a description of the movement of the curve. Candidates should be advised that an increase in carbon dioxide levels will cause the haemoglobin to have a lower affinity for oxygen which will result in the release of more oxygen. Too many candidates failed to score marks because they insisted on describing the effect as a more rapid/quicker release of oxygen or that the oxygen is released more readily. The crucial factor is the increased release of oxygen in this context. Very few candidates made any reference to the formation of carbonic acid and its subsequent dissociation. Nearly all, though not every candidate, scored a mark for the graph reading. Candidates struggled to find suitable wording to describe how foetal haemoglobin carries out its function. Since it has a higher affinity for oxygen than maternal haemoglobin it should have been easy to have described the transfer from one to the other. However, in many cases candidates simply discussed transfer across the placenta in vague terms rather than include specific references to the properties of the two types of haemoglobin. Many candidates thought that the role of myoglobin was as a store of energy rather than as a store of oxygen.
- Q.5 Most candidates found little difficulty in identifying B as a capillary or in its role of absorption of glucose/amino acids. Some candidates referred to C as a lymph vessel rather than as a lacteal and in identifying F, many candidates used the incorrect term of villus, rather than microvillus. The role of mucus was poorly understood. Far too many candidates simply stated the term 'protection' rather than explain how or why the protection was brought about. Many suggested that the mucus 'lubricates the food' or 'lubricates the alimentary canal' without any further amplification. A common, inadequate answer to part (c)(i) was 'lymph' and it was only a small minority of candidates who could answer part (c)(ii) correctly. Common incorrect answers were 'veins' and 'arteries'.
- Q.6 Most candidates answered both parts (a) and (b) correctly. A generalised answer to part (c) was 'to stop the atria and ventricles contracting at the same time'. This was far too vague as it failed to explain why that would not be acceptable. Most candidates understood that it was important for the ventricles to contract from the apex in order to push blood out of the heart with sufficient force but many however, failed to amplify their answer by stating where the blood left the heart. A common mistake in completing the table to describe the action of the heart muscle as a result of the SAN activity was to suggest only one atrium was involved rather than both atria.
- Q.7 The majority of candidates chose question (b) and the scores for question (b) overall, were much better than for (a). The answers to (a) were particularly disappointing as this is a human biology paper and the topic of tuberculosis is one of considerable importance. Few candidates made any reference to the disease being caused by a bacterium. In fact, a sizeable number stated that it is caused by a virus. Although most candidates knew that the organism was transmitted by airborne droplets, few made any reference to the necessity of it being inhaled for the disease to be spread. Some commented that it was spread more easily in overcrowded conditions. Accounts of control measures were very limited though a minority of candidates did write copious amounts on control methods in cattle which were not relevant to the question. Only a minority made a full and correct reference to BCG vaccination though a number did refer colloquially to being given a 'jab', the more biologically literate styling it a 'BCG jab'. Few made any reference to the Heaf test and whilst many made reference to the use of antibiotics very few explained anything about antibiotic resistance and the measures to deal with it. Few made any reference to an increase in cases as a result of opportunistic infections of AIDS sufferers. The classification question was answered very well by many candidates who were able to relate the salient points of each Kingdom. However, the main area of weakness was in knowledge of the Protocista, where many candidates simply left the description of members of this Kingdom as being those that did not fit into the other four Kingdoms. Few candidates made specific references to members of the Plantae possessing chloroplasts and in the case of Animalia few mentioned the nervous co-ordination feature of the Kingdom.

BIOLOGY / HUMAN BIOLOGY
General Certificate of Education
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Principal Examiner: Dr C. Blake

Unit Statistics

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Unit	Entry	Max Mark	Mean Mark
BY3	7472	44	32.6

Grade Ranges

A	35
B	31
C	28
D	25
E	22

N.B. The marks given above are raw marks and not uniform marks.

BY3

The format of the new answer booklet has helped candidates to structure their responses and in consequence the standard has improved and made it easier to mark. There were some centres where candidates were not given the new style booklets and in general the responses were weaker as a result.

Aim / prediction

Most candidates were able to identify 2 variables but still there are many who state that the 'rate of reaction increases with increased concentration' when they have actually measured time. Another common error is to make a general statement about enzymes and substrate but not giving the names of either. The vast majority of candidates did correctly link variables with direction.

Experimental design

- (a) (b) Virtually all candidates clearly stated the independent variable and gave an appropriate range. Concentration of hydrogen peroxide is now usually clearly expressed although there is still some confusion in some centres. An appreciable number still consider that the concentration of hydrogen peroxide expressed as volume refers to actual volume of hydrogen peroxide used.
- (c) The dependent variable with units was usually clearly expressed.
- (d) There is still much confusion between controlled variables and control. Many candidates are not able to clearly identify the controlled variables and even more to give appropriate values for each. Lists are common and candidates do eventually stumble upon suitable variables but rarely are values given.
- (e) The need for repeating readings is now generally understood.
- (f) Much improved candidates are now able to give a clear statement about how they would do the control and many even state why a control is necessary.
- (g) The main hazard is usually identified correctly but responses from some centres sometimes illicit the old faithful of not running, tucking ties in, wearing labcoats, using steel gauntlets and tying hair back, alas all sensible but not appropriate.

Results

Candidates find it very difficult to present a coherent table of results, column headings are often not given and are in appropriate for example 'time', 'concentration' and units are missed. Most candidates do the required number of repeats and calculate the mean albeit sometimes incorrectly.

It is rare for a candidate to gain full marks for the graph. There are a range of errors which include, not labelling the axis correctly, not giving units, sloppy plotting of points and failing to join points accurately.

Analysis

- (a) General trend. There were good responses with the candidates correctly stating the trend.
- (b) Many candidates still confuse reliability and accuracy but this is now much improved. Candidates still draw range bars but do not refer to them in this section. Bizarrely many candidates make a statement about the length or overlap of the range bars which do not actually relate to their data.
- (c) Much improved on previous years, the candidates now understand what is required here.
- (d) Suggestions for improvement still causes some problems, the use of thermostatically controlled water baths and pH buffers are popular but in several cases it is not an improvement because according to the planning they are already being used.
- (e) For the explanation of results a full but concise (please) statement is required. What is the enzyme being used, what is the substrate, what is an active site (or sight as commonly considered!), what is the collision theory, why did the graph plateau etc. We do not, however, want a general essay on enzymes discussing all the factors which affect enzyme activity.
- (f) Valid conclusions linking back to the original prediction were often given, this is much improved.

Further work

- (a) It was not uncommon for candidates to avoid stating the independent variable clearly.
- (b) Candidates did give two appropriate controlled variables but it was quite rare to have values given.
- (c) The expected results were normally correct but candidates are not required to write an essay of explanation here a simple annotated graph is suitable!

Microscopy

The quality of drawings has improved but there are still far too many which are sloppy, drawn with pencils which resemble graphite, incomplete lines, overlapping lines and shading.

If a part of a section of material is shown, for example, part of a leaf, part of the wall of the small intestine, or part of a section of stem, then this should be indicated using dotted lines at the margins. A series of parallel horizontal lines is not acceptable.

Candidates still do not seem to realise that the length of the epu. lines on the drawing should relate to the actual size of the area shown and that they are checked!

Labels are normally accurate but the label line should finish in the tissue and not at the line depicting the outer or inner margin.

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Unit Statistics

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Unit	Entry	Max Mark	Mean Mark
BY4	1771	80	42.6

Grade Ranges

A	55
B	49
C	44
D	39
E	34

N.B. The marks given above are raw marks and not uniform marks.

BY4

General Comments

The standard of responses on this paper were considerably lower than at Christmas. I saw several scripts where no attempt at all had been made to answer any of the questions and in one particular case covered with revision notes on BY5.

- Q.1 (a) It was very rare to get a correct answer to this simple calculation – many candidates do not have the vaguest idea about % increase, answers ranged from no increase to thousands of % increase and commonly there was no attempt. Responses to account for the low rate of population growth during the lag phase were often simplistic with no reference to protein synthesis, switching on of genes, digestion and absorption of nutrients. Many candidates could only respond by 'getting used to environment' which was just about acceptable. Although many candidates use the term exponential growth very few actually understood what it means. Most candidates were able to give two reasons for a decline in population.
- (b) Most candidates were able to state three conditions needed for the growth of bacteria.
- (c) The calculation was poorly done with very few correct answers, many ended up with 243 something and even 246 something.
- (d) Candidates were able to give two precautions to ensure aseptic conditions.
- Q.2 (a) The identification of the structures in the spinal cord caused a problem for most candidates but most understood why white matter was white and grey matter grey.
- (b) There remains much confusion about the position of sensory, relay and motor neurons. Many candidates ignored the rubric and just drew a normal reflex pathway (usually very poorly), many did not label anything and an alarming number converted the dorsal root into one sensory neurone and the ventral root into one large motor neurone both clad in Schwann cells. The difference in function between an axon and a dendrite was quite well done in most cases.
- Q.3 (a) Most candidates were able to identify the names of the process and explain why it is possible for three metabolic pathways to take place independently in the same cell. Knowledge of the light dependent reactions was excellent.
- (b) Very few candidates were able to give two reasons why photosynthesis is essential for the survival of animals on this planet. Production of oxygen was often given but production of organic materials rarely.
- (c) Candidates struggled to state the importance of nitrates and magnesium.

- Q.4 (a) Many candidates referred to light intensity rather than length of the photoperiod.
- (b) Very few candidates could make any conclusions about the experiment other than that the length of the photoperiod is detected by a leaf. The stronger candidates were able to give a control. Relevant conclusions from the grafting experiment were rare but achieved by some.
- Q.5 (a) Candidates had a good knowledge of the concept of threshold and achieved very good marks. Most responses to explain the change in potential difference during an action potential were detailed and accurate. There were many impressive responses.
- (b) Very few candidates were able to give the possible mode of action of excitatory and inhibitory chemicals on the transmission of the impulse across a synapse, an alarming number did not seem to understand the meaning of the terms inhibitory and excitatory which did cause a slight problem!
- Q.6 There was sound understanding of the homeostatic control of water potential in the body. Most candidates achieved high marks although the term endocrine was rarely given.
- Q.7 (a) Adaptation of nephron and associated blood vessels. We did not see many full marks in this essay as we have to some in the past. The candidates had to think rather than to regurgitate. The adaptation of the cells in the proximal convoluted tubule were not always fully stated and in many cases a bit sloppy, for example they have mitochondria rather than high numbers of mitochondria. Descriptions of the counter current mechanism were very good and responses were fully developed.
- Q.8 (b) Comparison between synthesis of ATP in mitochondria and chloroplasts. There were a number of really excellent responses, well-structured and well explained, but many candidates did not compare but just gave two separate accounts. An appreciable number restricted their response to either chloroplasts or mitochondria but not both. Some accounts were rambling and not logically structured.

BIOLOGY / HUMAN BIOLOGY
General Certificate of Education
Summer 2012
Advanced Subsidiary/Advanced

Principal Examiner: Dr Neil Roberts

Unit Statistics

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Unit	Entry	Max Mark	Mean Mark
HB4	100	80	39.6

Grade Ranges

A	52
B	47
C	43
D	39
E	35

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HB4

- Q.1 Many candidates failed to correctly identify D as being the central canal or C as being the dorsal root ganglion. Candidates lost marks in c) (ii) by failing to be precise when stating the function of feature Y. References to insulation alone were common.
- Q.2 The majority of candidates scored well in (a) and (b), but some failed to correctly identify the group of biological molecules in (c). Most candidates picked up two marks for part d). References were made incorrectly by some candidates to NAD or NADH instead of NADP.
- Q.3 Most candidates made correct reference to nitrogen fixation in part b) and identified the bacterial genus involved. Some confusion did exist with a few candidates who mixed up *Azotobacter* with *Rhizobium* or who misspelt the genus. Part c) elicited some good responses often making reference to increasing aerobic conditions but some failed to gain full marks as reference was only made to either inhibiting denitrification or promoting nitrification, not both.
- Q.4 Parts a) and b) were well answered with most candidates able to correctly label the items required. Most diagrams drawn did show a clear reduction in size of the sarcomere. Part c) required two differences to be described. It was therefore essential that a comparison was made. The most common answers did identify differences in the number of mitochondria and adaptations for aerobic/anaerobic respiration. References to colour of fibres were not accepted. Part d) did elicit vague references to amount of mitochondria which was not accepted.
- Q.5 Some candidates made references to sterilising the bench in part a), which was not accepted as this would not be possible. References to disinfecting benches were made by most candidates. A significant number of responses in part b) failed to identify the shape as cocci despite correctly stating that the bacteria were gram positive. These candidates also failed to explain fully why bacteria stained differently often because they confused the cell wall structure.
- Q.6 Part a) had a relatively straight forward tick box answer. Many candidates still failed to use ticks **and** crosses despite this being clearly stated in the question stem. Many candidates failed to explain the significance of reducing pyruvate to lactate in order for NAD to be regenerated so that glycolysis could continue. References to lactate being less toxic were made by a number of candidates.
- Q.7 Definitions of resting potential were often poor, with candidates failing to mention '...when a nerve impulse is not being conducted'. Part b) produced some responses where confusion existed between the direction of the passive movement of Na⁺ and K⁺ ions with their direction when actively transported. Answers often included a description of resting potential which would have given credit if they had been made in part a). Disappointingly a significant number of candidates were unable to calculate percentage increase in reaction times. The remainder of the question proved to be a good discriminator as candidates failed to give a context to their answer, or because they just described the data shown without giving a valid explanation.
- Q.8 Microscopy of the kidney is a suggested practical activity. For candidates that had covered this, part a) and b) were well answered. Part c) elicited some good explanations, but references to microvilli needed to be relative, not just to provide a large surface area, and needed a reason e.g. for diffusion. The remainder of the question proved to be a good discriminator as many candidates failed to explain that the increase in urea concentration was due to water being reabsorbed by osmosis whilst urea is not reabsorbed, so the same mass of urea would be present in less water. Part c) iii) was a suggest question – it elicited some suggestions but most candidates failed to explain why i.e. increased water in diet was mentioned by many, but the explanation that this would result in more water in the urine was omitted. Very few candidates suggested a suitable reason why cells in region S would become osmotically damaged.

Q.9 Both essays were answered well with about an equal split in responses.

- (a) The kidney essay was answered well with many candidates scoring over 7 marks. Some candidates were confused with the peritoneal dialysis procedure making references to the peritoneum being filled with fluid, rather than the abdominal cavity. Most candidates failed to make reference to specific molecules diffusing out into the dialysis fluid e.g. urea or excess water or that the dialysis fluid has the same water potential as normal blood.
- (b) The synapse essay was also answered well by most candidates. Most made reference to the breakdown of acetylcholine by acetylcholinesterase and its subsequent recycling in the presynaptic knob which was not required. Some candidates made reference to acetylcholine lingering on the post synaptic membrane as being the cause of Parkinson's disease rather than due to a lack of dopamine.

BIOLOGY / HUMAN BIOLOGY
General Certificate of Education
Summer 2012
Advanced Subsidiary/Advanced

Principal Examiner: Mr G Rowlands

Unit Statistics

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Unit	Entry	Max Mark	Mean Mark
BY5	4236	80	44.0

Grade Ranges

A	54
B	49
C	44
D	40
E	36

N.B. The marks given above are raw marks and not uniform marks.

BY5

- Q.1. All parts of this question were answered correctly by most candidates. The only exceptions were with 1a – some confusing secondary productivity with trophic efficiency; and with part e where a variety of responses were offered by a number of candidates who seemed unfamiliar with the term monoculture.
- Q.2 (a) Many candidates were not sufficiently precise in defining pollination as the transfer of pollen from an anther to a stigma.
- (b) Most candidates identified X as the ovary or ovule rather than the embryo sac as shown in the diagram. Many candidates lost a mark in the second part of the question for indicating clearly that the pollen tube grows through the ovary tissues to the point opposite the micropyle before emerging into the loculus of the ovary.
- (c) Only a small number of candidates failed to recognise the oviduct/fallopian tube as the site of fertilisation. However, the spelling of these terms was poor pushing the acceptance of phonetic spelling to its limit in many cases. A large number of candidates identified Y as being enzymes rather than containing or releasing enzymes for the digestion / softening of the zona pellucida (not the egg/oocyte membrane).
- (d) The question asked for similarities visible in the diagrams. Candidates should be encouraged to read the rubric of the questions to avoid losing marks by not answering the question as set.
- Q.3 While the question was generally answered well a significant number of candidates did not recognise that the results indicated linkage or that crossing-over can lead to the formation of recombinant phenotypes.
- Q.4 Candidates really had to think and consider which terms correctly related to the statements. Many candidates recognised that the fossil record of the pentadactyl limb (a) provides evidence that can be used in classification. Survival of the fittest, as shown by the appearance of antibiotic-resistant bacteria (b) and the survival of plant feeding bugs (e) was not as well recognised but many candidates did recognise that isolating mechanisms can result in divergence and that it can be geographical (c) or reproductive (d). Fewer candidates recognised the jaw formation of cichlid fish (f) as an example of divergence.
- Q.5 (a) Some candidates confused gene therapy and genetic modification but on the whole the question was well answered. In addition, very few candidates did not know the difference between somatic cell and germ line therapy.
- (b) (i) The majority of candidates were able to recall the symptoms of cystic fibrosis but did not always limit their answers to respiratory symptoms including the effects on digestion and in some cases reproduction in their responses. A significant number were unable to give a detailed account of the underlying cause of CF in terms of the function of the (mutated) CFTR gene. Furthermore, quite a large number of candidates focussed on the effects of a mutation on protein synthesis.
- (ii) The main problem here was candidates choosing to describe the production of recombinant bacterial plasmids rather than recombinant viruses or liposomes as the vector.

- (c) (i) Despite detailed feedback given on a similar question in a previous BY5 paper there remains much confusion over the use of strand and molecule. Many candidates described that a strand of DNA is made of one new and one old strand rather than referring to a molecule of DNA. Many merely referred to 'half the DNA is old and half is new' with no reference to strands or molecules at all.
 - (ii) Poor communication skills cost many candidates marks on this question and many merely referring to enzymes in general and with no obvious understanding of the significance of the different temperatures used at each stage of the PCR.
 - (iii) Most candidates focussed on the problems caused by faulty CFTR rather describing the impact of inaccurate copying of the DNA in terms of the effect on the DNA base sequence, the role of mRNA and tRNA in production of a protein with a different structure and function.
- Q.6 (a) The vast majority of candidates knew the enzyme involved.
- (b) While the question was answered well in general, errors were made in completing the complementary bases on the strands of DNA and the anticodons on the tRNA molecules.
- (c) A surprising number of candidates did not identify alanine as amino acid X. Most candidates gave correct explanations of the effects of the two mutations shown but others gave only general descriptions of mutations rather than relating their knowledge an understanding to the sections of DNA shown.
- (d) Candidates lost marks in this question on the whole, by being again imprecise in how they communicate their understanding of translation. Many mixed up codons and anticodons or described the formation of peptide bonds between tRNA molecules.
- Q.7 (a) Most candidates identified the sites where the plasmid was cut but not all were able to identify the fragments produced from either the plasmid or the graph.
- (b) A surprising number did not correctly identify the colonies on the replica plates.

Again many demonstrated a good knowledge of the role of the marker genes in genetic engineering but gave general answers rather than using their understanding to explain the results shown. In addition there was much confusion as to what developed resistance or not with some candidates referring to the human gene or even the antibiotic being resistant. Many suggested that the plasmids contained the antibiotics rather than the antibiotic resistance genes and many did not appreciate that the inclusion of the human gene destroys the tetracycline resistance gene so those colonies with the recombinant plasmid could not grow in the presence of tetracycline.

- Q.8 (a) Most candidates chose to describe succession and climax community rather than give explanations of the meaning of these terms.
- (b) The majority of candidates recognised the increasing competition for resources as the main cause of the decrease in plant species diversity, although some interpreted the question in terms of evolution and survival of the fittest.
- (c) Very few candidates communicated a knowledge or understanding of the changes in GPP and NPP during succession. Most focussed on the heather not needing to produce more leaves over time rather than the impact of competition or reduced soil fertility.
- Q.9 Both essays were answered well on the whole. A couple of points only: some candidates focussed on overfishing and deforestation rather than giving a more general account of conservation methods; and there was some confusion as to which cells can be used in nuclear transfer and embryo cloning with some entertaining ideas about the use of sperm cells providing donor nuclei!

BIOLOGY / HUMAN BIOLOGY
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Principal Examiner: Mr K. Davies

Unit Statistics

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Unit	Entry	Max Mark	Mean Mark
BY6	4250	50	39.5

Grade Ranges

A	42
B	39
C	36
D	33
E	31

N.B. The marks given above are raw marks and not uniform marks.

BY6

General Comments

BY 6 has once again proved to be a good source of marks for candidates, generally irrespective of their ability in the theory papers. The vast majority of centres have employed good practical skills from the outset of this specification, with skills being transferred from the old BI 6. Indeed these centres often show a simple but effective report of the investigation and allow the candidates to gain full access to the marks available. However there are still a few centres that have adhered to their own interpretation of the mark scheme, and despite the best possible advice in past years, they have continued to work outside of the guidance and the mark scheme.

The standard continues to improve within the vast majority of centres and some exceptional individual reports have been submitted this year. Hopefully everybody will use the appropriate answer booklet in 2013. Treasury tags should be used to 'attach' the microscopy work not to tie it so tight that the booklet cannot be opened and one booklet is sufficient for the majority, some candidates used 3 again this year!

If there is any need for assistance, then please contact the Biology subject officer, who will forward your query to me.

Design

Candidates on average got 9 marks from the available 11 in this section. There were a number of reasons that the 2 marks were lost, such as the usual poor risk assessment or the inability to explain the control experiment in enough detail. Appendix 1 discusses those issues seen again this year but have been highlighted in previous years. One worrying trend seen this year was the obvious completion of the practical work collecting raw data and then the construction of a prediction for the investigation. There were instances of candidates correctly predicting the optimum temperature in a methylene blue experiment to 2 decimal places. This sort of approach to the investigation is unacceptable and cannot be justified by any reasoning.

Results

Candidates generally scored better in this section compared to previous years. I draw your attention to the 2010 report which discusses many of the problems in detail. One problem that was commonly seen this year was the construction of the table of results. I believe that candidates genuinely struggled to sort out what goes where and why and in this confusion simple details, such as 'units', are lost and so are the marks. In last year's report I gave the 'general' table I would use with my own pupils:

INDEPENDENT (units)	Description of the DEPENDENT (units)				RATE (units)
	Attempt 1	Attempt 2	Attempt 3	Mean	

I still think this serves them well and could help a number of candidates gain more marks in this section.

Analysis

This is the section that gives the greatest variance in marks. The inclusion of the required elements on the inside front cover of the answer booklet I believe has helped a number of candidates gain more marks here. Giving them support in structuring their answers seems to give them clarity and clear answers are therefore provided. Having said that, some candidates did not pay a blind bit of notice to it and ploughed on regardless, making it hard for the examiner to find the marks. Biological knowledge for 6 marks requires a lot of detail. This is still something that eludes the majority of candidates both in laboratory and fieldwork based investigations. This is hard to describe for every scenario seen this year. For example, if an investigation obviously hinges on the performance of a particular enzyme, not naming that enzyme and referring to it as “enzyme” will not allow a candidate access to the 6 marks. Naming “dehydrogenase”, for instance will certainly allow access to the full 6 marks if the surrounding detail is correct. The context is important as well – naming the enzyme in the last line of a 3 and a half page report, usually with a different pen, does not instil the confidence to award the ‘coherence’ mark, this was the sound belief of the whole team.

There is also the belief amongst the candidates that there is always a better piece of apparatus to measure or record. Stop clocks bore the brunt of this and it was commonly suggested that a ‘better’ stop clock could be used. Most stop clocks these days already record to 1/100th of a second, how much ‘better’ could they get? And the age old “get someone else to do it” is still seen – after all the comments made over the years!!

Further work

It is still the case that some candidates DO NOT ATTEMPT this section. I cannot understand or reason why this would be the case, as the instances have been individual candidates in centres and even whole centres. The issues have been similar to the ones previously seen, but perhaps the trend this year for those candidates who lost most marks was to expand the initial independent variable. The mark scheme clearly asks for a different independent variable.

Microscopy

In the previous specification I believe that candidates were given an opportunity to enhance their skill set through microscopy work after a significant investment of time by teachers in schools. I still believe it is an invaluable skill to learn as it develops a number of individual skills, not to mention patience! I say this as the standard of drawings is declining and I will make every attempt in the new specification to ensure that the drawing will be assessed in one way or another.

In the 2011 report I said:

“I finish this section by once again saying that the mark scheme has had a particular method for calibrating a microscope for several years. If a centre chooses to use a method that does not hit the marking points in the mark scheme, then marks will not be awarded. I have said this several times at inset meetings and varying methods are still seen that when used do not meet the mark scheme criteria.”

I will say it time and again; if centres choose not to use the prescribed method in the mark scheme they will not gain marks. This will penalise the candidates within those centres that continue to ignore this advice.

Appendix 1

Marks not gained in this section were down to a whole range of simple errors, including:

- not identifying which is the independent or dependent variable.
- not giving units for the dependent variable.
- giving correct control variables but no values.
- stating that repeat readings were taken, but no reason as to why that should be the case.
- candidates not attempting to get both marks for the control experiment.

The controlled variables slipped into the lists of old for a lot of candidates and therefore impeded progress. This question now asks that the response is far more structured, i.e. naming a variable and giving its value to be controlled at and doing the same for a second variable. A concise answer here seemed to score better marks than those answers that for some candidates seemed to go on forever and not indicate which value was for which variable, a bit of a pick and mix scenario which will not score marks.

Repeat readings scored an easy mark for most, with them giving a statement of why a repeat is necessary, with a range of valid answers being credited. Those candidates who did not get this 1 mark, did so for commonly one of two reasons:

- Their answer just indicated that they were going to conduct repeat experiment without the reasoning behind doing so.
- The candidates had not even attempted this question for some reason or another.

A suitable control was offered by the majority including some of the reasoning for conducting a control. It was in fact quite common to see 3 valid marking points given when discussing the control experiment, which were:

- a reference to some sort of inactivation of one element in the experiment.
- maintaining all other values of volumes and conditions at a constant level.
- explaining the significance of a control.



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