WJEC
CBAC

GCE EXAMINERS' REPORTS

BIOLOGY / HUMAN BIOLOGY
AS/Advanced

SUMMER 2011

Statistical Information

This booklet contains summary details for each unit: number entered; maximum mark available; mean mark achieved; grade ranges. *N.B. These refer to 'raw marks' used in the initial assessment, rather than to the uniform marks reported 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.

BIOLOGY / HUMAN BIOLOGY

General Certificate of Education

Summer 2011

Advanced Subsidiary/Advanced

Principal Examiner: Mr P Owen

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	4683	70	36.3

Grade Ranges

A	48
B	43
C	38
D	34
E	30

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

Biology BY1

General Comments

As usual, the range of results was wide with some outstanding papers seen but, on the other hand, some very poor quality work was submitted. A continuing problem lies with many candidates failing to make the necessary progression from GCSE to A level as exemplified by a poor grasp of scientific vocabulary and the inability of many candidates to express themselves clearly in a concise manner. The use of the term 'substances' rather than molecules and 'works' instead of reacts or rate of reaction are just two examples by way of illustration.

Q.1 This proved to be challenging with few candidates scoring maximum marks. A simple absent vs. present was all that was required with respect to mitochondria. Many candidates were unable to convey this concept in simple terms even when they were aware of the fact. Many candidates were unable to state that the cell's DNA is present in the nucleus instead, a number insisted on giving the term nucleolus. Few candidates were aware of the presence of murein in a prokaryote cell wall and even fewer could provide a correct spelling. It was pleasing to note that a number of candidates were able to state the sizes of ribosomes as 70s vs. 80s though small(er) vs. large(r) was enough to secure the mark.

Q.2 Candidates continue to find difficulty in understanding and explaining the workings and principles behind a biosensor despite many questions being set on the topic over the life of the specification. In answering part (a) candidates did not express themselves clearly with regard to the need for the enzyme being capable of immobilisation. The enzyme also needs to be stable, but answers often referred to tolerating a range of unspecified conditions. Few candidates made reference to the need of the enzyme being specific instead chose to describe enzyme substrate complex formation. The role of the membrane continues to baffle candidates. In this example the passage of glucose is permitted but the passage of other molecules is prevented.

Transmission to the display was poorly understood with many candidates not appreciating that the enzyme catalyses the conversion of glucose and so, the concentration of glucose is not directly measured by the electrode instead, it responds to the products of the reaction and converts the chemical signal into and electrical signal.

The answers to part (d) often made vague references to it being a 'fair' test rather than making reference to the effect of temperature on the rate of diffusion or the rate of reaction of the enzyme.

Q.3 In answer to part (a)(i) most candidates could give the name ‘fluid mosaic model’ but were unable to go any further. There was some mention of the ‘lipid’ nature of the membrane but few candidates could give any comment about its fluidity and the mosaic appearance of the scattered proteins.

A number of candidates knew that the role of the channel protein was to allow transport across the membrane but rather shot themselves in the foot when they referred to insoluble or lipid soluble molecules passing though by diffusion. Active transport was well understood but the use of the term ’substances’ was prevalent.

Few candidates could give an adequate account of why transport is essential to the cell. Reference to nutrients passing in or oxygen passing in were the commonest correct answers. Few candidates made any reference to the removal of toxic molecules.

Q.4 Many candidates scored both marks for the calculation in part (a) but the commonest mistake was not to calculate the rate per minute as asked by the question.

Few candidates could give satisfactory explanations in part (b). The question asks why is the rate higher at the beginning but many candidates chose to give an explanation in terms of why it was slower after 30s which is not answering the question. Many candidates referred to active sites being empty at the beginning which is a misunderstanding of the position.

Candidates found it difficult to give a full explanation of the effect of temperature on the rate of reaction in part (c)(ii). Far too many stated that the enzyme started to denature at the optimum yet at the same time stating there was the maximum rate of reaction at this temperature. Few candidates could view the graph overall and make a statement that the rate of reaction increased up to the optimum temperature of 100 degrees and then state that the rate fell from that point until 130 degrees. Many candidates referred to ‘collisions’ between enzyme and substrate rather than successful collisions.

Few candidates could give two differences between the two enzymes usually giving one or none. In many answers the term ‘works better’ was seen which is not acceptable at this level.

Q.5 Parts (a) and (b) of this question were usually well answered though the commonest mistakes in (b) were to describe the bond as either an ester or glycosidic bond. Despite part (c) asking candidates to describe a test many chose to ignore the instruction and just stated the name of a test, often incorrectly citing Benedict’s test as the appropriate test. Descriptions of colour change which was what was required were many and varied but the usually accepted change is from pale blue to mauve/lilac for a positive result.

Few candidates appreciated that difficulties in determining a colour change from pale blue to lilac would be the situation if a low concentration of proteins were used.

Q.6 Candidates were able to identify the two structures. However, they had little idea of the roles of structures E and F and answers often lacked detail. In the case of structure F candidates found it difficult to express the idea that vesicles bud off from the Golgi Body and even more difficult to give a precise role for the vesicles.

Answers to part (c), despite the stem of the question referring to the cell as a secretory cell often bizarrely referred to a muscle cell. The different positions of the two mitochondria was often appreciated by candidates who then found difficulty in expressing their thoughts.

Q.7 This question was poorly answered as questions on plant tissues are so often. Only about half of the candidates could name structure J as the plasma membrane with many regarding it as the tonoplast or vacuole. The concept of solute potential and water potential are not well understood and few candidates recognised that after one hour 50% of the cells were at the point of incipient plasmolysis and therefore there was no net movement of water despite the clues being provided in the question rubric.

The role of K in generating pressure potential is also not understood. Few candidates made any reference to the point that the cell wall is inelastic. Many made reference to the cell wall preventing the cell from bursting but this was not enough to answer the question. Few candidates described the expansion of the cell contents as water passes into the cell.

Q.8 Question (b) was the more popular and on the whole, better answered of the two questions in this section.

The commonest mistake in the answers to part (a)(i) was for candidates to give a detailed description of mitosis which not only wasted their time but also scored no marks. The usual points made in this part were a reference to growth and the fact that mitosis gives rise to identical/genetically identical cells. Few candidates gave any relevant examples despite the question asking for examples. The other marking points in part (a)(i) were seen only rarely.

Part(a)(ii) was usually more mark yielding with all marking points being seen though candidates usually made reference to haploid vs. diploid, two divisions vs. one and crossing over leading to variation in meiosis.

A common mistake in (b) was for candidates not to make it clear that it is a nucleotide that has three components instead, many referred to the DNA molecule or, more usually DNA having three components. Few candidates made reference to purines and pyrimidines which meant several marking points were not accessible and very few candidates made any reference to the sequence of bases determining the amino acid sequence of a protein. A reminder that diagrams should be fully annotated otherwise they will gain no credit. Few candidates made any reference to the sugar phosphate backbone and surprisingly a sizeable number made no reference to *complementary* base pairing.

BIOLOGY / HUMAN BIOLOGY

General Certificate of Education

Summer 2011

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	6427	70	35.4

Grade Ranges

A	50
B	45
C	40
D	35
E	30

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

Biology BY2

General Comments

The usual range of scripts were seen; from the truly superb, polished and knowledgeable scripts in the 60's showing a fine understanding of biological principles to the somewhat sad offerings below 10.

Not using correct biological terms and poor exam technique lost many able candidates a lot of marks. Many had not learned the work at all; there were blank spaces and confusion was evident in the scripts.

Q.1 This was intended as an easy start to the paper and for those who had revised this work, it proved to be just that. However these scripts were few and far between and far too many showed no knowledge of metamorphosis at all, confusion over types of metamorphosis and no knowledge of the stages involved. The spelling of metamorphosis was dreadful and although phonetic spelling is given, entire syllables cannot be left out.

This is such a basic bit of biology that examiners were quite shocked at the poor level of knowledge of many AS level Biology candidates.

Q.2 Classification of the cheetah was generally good, but with the usual confusion over chordates and vertebrates. There was also confusion between chordates and mammals, although most knew the features of the taxa. In (c) very few recognised that this description was that of a genetic bottleneck. (d) elicited some very vague and wishy-washy answers which did not gain credit. Vague references to "analysing DNA" were not good enough and nor was "that they would have the same bases" in (ii), since all organisms on earth contain the same four bases. Only the best answers referred to the sequence of bases or equivalent would be very similar in closely related cheetahs.

Q.3 Some massive confusion in weaker scripts with food poisoning, so lots of washing hands, good hygiene, not touching raw food etc abounded. Despite being told that it was a pork tapeworm, some wanted the secondary host to be a cow or other animal. In (b) the features were generally given correctly although many forgot to say that the scolex had hooks and suckers, so did not gain credit (after all, the suckers are drawn on the diagram). There is a new term creeping in here which did not gain credit; hookers (nor did teeth or claws). Most answered (d) correctly.

Q.4 Part (a) was well done, but there was confusion with epithelium, endothelium and endodermis, not surprisingly. The remainder of the question was really well done in many scripts with full marks not being unusual. The usual mistakes were not explaining how stomata reduced water (vapour) loss (by closing at night/under water stress) and giving a superficial description of stomatal opening.

Q.5 This again was really well done in many scripts with 7/7 being quite common. In (b) the question does ask for visible differences (spot the difference) between the two photographs which does mean the candidate has to actually look at the photos and analyse them; not difficult really. However, as there is evidence that many candidates are folding their script back on itself, it is possible that many did not look at the photos, but thought up answers from their knowledge. The only differences which are visible are the sizes of the air spaces (not pockets/gaps/vacuoles) and positions of the stomata. (c) led on from (b) and many scored full marks here although there were many references to *Nymphaea* not having <u>any</u> cuticle because it needed to lose water. There is also much confusion over the role of stomata, since numerous scripts thought that they let in sunlight or water; their role in gas exchange and hence their position at the top of the leaf where air is freely available was not appreciated.

It is worth mentioning here that examiners/printers take exceptional care to ensure that questions involving photographs and diagrams are placed with the questions facing them (hence the occasional BLANK PAGE). Candidates should be encouraged to keep their scripts fully open when answering all questions to promote returning to the stem of the question and any artwork with which they have been provided.

Q.6 Clearly whatever we as teachers may think, there is much confusion over the workings of the heart, the cardiac cycle, movements of valves, pressure changes and chamber wall thickness and the reasons for the differences. This is human (mammalian) biology; everyone has a heart and yet this was not well done at all despite legions of candidates saying they prefer human biology to plants! Very few scripts showed a knowledge of valves opening and closing in the correct sequence, although with a little knowledge and a lot of understanding this could be worked out. Even fewer could simply state that the pressure in the aorta does not drop to zero because the aortic semi-lunar valve closes to prevent blood flowing back into the relaxing ventricle (hence the pressure is maintained). There is huge confusion over the histology of the aorta. It is an elastic artery made up almost entirely of elastic fibres. It certainly does not contract to push the blood forward. During systole, their elastic layers are stretched and reduce blood pressure. During diastole, the **elastic rebound** helps <u>maintain</u> arterial pressure; it does not prevent it falling below 80mmHg.

Part (c) should have been an easy two marks, but weaker scripts gained no credit for some wonderfully inventive maths.

In (d) there is a lack of basic knowledge on heart structure and function. There is also confusion over deoxygenated (designated low pressure – presumably meaning a low O_2 PP) and oxygenated blood (designated high pressure – presumably meaning a high O_2 PP). Candidates are implying that because the oxygen levels are high there is a high pressure and vice versa. Few candidates linked the fact that the chamber wall muscle thickness increases with the increasing pressure needing to be generated to send blood increasing distances from the heart chamber.

Q.7 Again, those who took time to think this through and referred to the method and table of results routinely scored well. Many (b) (ii) answers clearly showed a lack of function of bile; far too many gave bile an enzymatic role and tried to put the entire experiment back into the gut, so got into a real pickle. (c) was well done and for many weaker scripts gave them the bulk of the marks. In (d) only those who thought about this collected this mark. It needed some explanation of why high fat milk was used and better scripts did refer to higher substrate levels giving more fatty acids and a faster colour change.

Q. 8 These two essays were probably not far off equally popular. There were some superb essays for both, with many gaining full marks.

Marks were lost in (a) mainly because insufficient examples were used and a lack of detail and correct use of terminology (especially with insects) or because candidates wasted valuable time on fish, amoebae and flatworms (all living in aquatic environments).

In (b) marks were lost because of a poor graph shape and incorrect positioning of the lines. Lines were often not labelled correctly. Axes were rarely labelled correctly despite the BY3 training in drawing graphs. Theory was good on the whole although weaker scripts tied themselves in knots with llamas, lugworms, foetuses and the Bohr effect; lines were described as moving up/down/left/right almost at random which led to some very confused and incorrect theoretical explanations.

BIOLOGY / HUMAN BIOLOGY

General Certificate of Education

Summer 2011

Advanced Subsidiary/Advanced

Principal Examiner: Dr C Blake

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
BY3	7313	44	31.2

Grade Ranges

A	34
B	30
C	26
D	23
E	20

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

BY3

General Comments

There has been a general improvement in some areas but many centres seem to be ignoring the advice and comments made in examiners' reports on previous occasions.

In general, the choice of experiments is good with most centres sticking to the 'tried and tested'. There are exceptions, but in general candidates choosing to do an experiment involving water potential do not score as well as candidates choosing an enzyme-based practical. Controls, further work, stating the trend and explanation of results all causing considerable problems.

Most candidates were able to link two variables with direction although many still mention rate when rate has not been calculate and does not appear in a table or graph. Others fail to give the names of enzymes or substrates and make a statement such as 'the temperature increases the rate at which the enzyme breaks down the substrate increases.'

Independent variable, range of independent variable, dependent variable and controlled variables were usually clearly stated, but an alarming number of candidates still insist on using the term 'amount'. This is not an acceptable scientific term!

There remains some confusion about the difference between control and controlled variables, and very few candidates state why a control is necessary.

Candidates do not always identify the main hazard of the experiment and it was not uncommon to read statements such as 'make sure hair is tied back, bags are under benches and pick up broken glassware carefully using a dustpan and brush' when the candidate is using hydrogen peroxide at a concentration of (if they are to be believed) 100vol.

Tables are improving, but tables should be self-explanatory, for example, 'concentration' of what, 'time' for what? We did accept time in seconds to two decimal places this year but in future examinations we will only accept time to **the nearest whole second**.

Graphs are usually good but many candidates do not label axes correctly, for example, candidates will label the Y axis as time in seconds, not **mean** time in seconds.

General trends were usually correctly stated and comments on reliability (repeatability) made, some candidates use range bars but do not refer to them or refer to them incorrectly, for example, statements such as 'my results are reliable because my range bars are small', when they are very long and overlap.

Comments on accuracy and methods of improving accuracy were much improved.

Explanations of results tended to be long, rambling accounts with an interpretation that an essay on 'everything I know about enzymes and the factors which control the rate of reaction' was needed.

Accounts need to be far more relevant to the task.

The conclusion should link the results back to the prediction.

Further work was usually good but, in some centres, missed completely. For the expected results many candidates reverted to theory, for example, giving a graph of rate of reaction when they had proposed to measure time.

The standard of drawings in the microscopy section was not good. Drawings were scruffy, sometimes in ink on lined paper, shaded and cells were drawn.

The proportions were usually inaccurate. The examiners do check that the epu. values are consistent with the dimensions of the tissue layers represented. Epu lines, as indicated in the teacher guidance notes, should be across the entire drawing or across a specific tissue region, not to an area outside of the specimen or between tissue layers.

BIOLOGY / HUMAN BIOLOGY

General Certificate of Education

Summer 2011

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
BY4	1757	80	52.4

Grade Ranges

A	62
B	57
C	52
D	47
E	42

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

BY4

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 all three marks for part (a). In part (a) (i) some candidates failed to label the base or labelled it incorrectly. In part (a) (ii) the most common errors were 'andenine triphosphate' and 'andenosine triose phosphate.'

In part (b) (i) there were some very poor drawings despite only having to copy them from part (a). Most candidates were able name an intracellular energy requiring process for part (b) (ii).

In part (c) the table was correctly completed by fewer candidates than expected, apart from not getting the numbers of molecules right, many candidates did not describe both matrix and mitochondria for **precise** location. Parts (c) (ii) and (iii) were generally well answered.

There was some confusion with anaerobic respiration in animals in part (d) with 'lactic acid' being given quite often.

Q.2 This question was generally well answered with most candidates scoring a majority of the marks.

However many candidates did not describe a difference in part (a) but gave one or two words in their answer eg. 'the spots' At this level candidates are expected to write a sentence which describes the pattern in a sequence of observations.

Parts (b) and (c) were correctly answered by the majority of candidates.

Some candidates gave nitrate, amino acids or even protein for part (d) even though the question asked for a chemical element.

In part (e) (i) there was some confusion of X with Y, some candidates got ATP – ADP or $NADPH_2$ – NADP the wrong way round, some gave NAD instead of NADP. There was also confusion where candidates attempted to use the $NADP^+ + H$ convention.

Q.3 There was a great variation in the quality of drawings of an action potential, though most candidates were able to indicate the correct values for resting potential and peak action potential. Correct labelling of ‘depolarisation’ and ‘repolarisation’ was relatively less frequently correct.

Part (b) (i) Most candidates knew that the pumps are proteins but fewer gave phosphlipids for the bilayer.

Parts (b) (ii) and (c) required good English and orderly presentation so poor quality of written communication sometimes cost candidates the marks.

There was some confusion with the role of calcium ions in part (c), some candidates described them crossing the synaptic cleft and binding to the post synaptic membrane.

Q.4 The majority of candidates scored at least 1 mark for each of parts (a) (i) – (iii). Fewer scored both marks for (ii) because of confusion about the nature of the bacterial cell wall or (iii) because they failed to explain that facultative anaerobes respire more efficiently in the presence of oxygen.

In part (b) most candidates were able to distinguish between total and viable count in part (i)

Part (b) (ii) was not well answered. Many candidates appeared not to understand the instruction to ‘annotate’ and restricted their answer to some labels. (This is consistent with candidates not annotating diagrams in question 7, even though they are explicitly directed to do so.)

Part (b) (iv) was not well understood. Many candidates gave another description of the serial dilution and few described the need to inoculate plates with a measured volume of the diluted samples. Frequently candidates omitted to say that the agar was nutrient agar or described nutrient agar plates as ‘Petri dishes’.

Q.5 Most candidates were able name the phases of a growth curve in part (a) though there was some confusion between log. and lag phases. Also, in (b) (i) most candidates knew that the curve went down if death rate exceeded birth rate but there was some very inaccurate labelling. Usual problem with quality of written communication in (b) (ii) with candidates’ answers difficult to read or make sense of.

Some poor answers given to parts (b) (iii) and (iv) one word answers like ‘food’ or ‘water’ are not acceptable at this level.

Q.6 The majority of candidates were able to name a nephron in part (a).

In part (b) (i) almost all candidates correctly identified the parts A-F though there was some confusion about proximal and distal convoluted tubules. Relatively fewer candidates were able to correctly describe the function of the loop in (b) (ii).

In part (c) most candidates were able to name the hormone in part (i) and the endocrine gland in part (ii), but in part (iii) fewer recognised the wall of the collecting duct as the effector, nor how the hormone changes the permeability in part (iv).

Most candidates were able name the nitrogenous excretory product in freshwater fish, fewer knew that for insects, and even fewer were able to explain the advantage to insects of excreting uric acid.

Q.7 Option 7(a) was the more popular choice. A range of marks were awarded. Some candidates clearly and systematically described how the various forms of nitrogen compounds were converted from one to another and gave the names of the bacteria involved in those changes, scoring maximum marks.

Some candidates restricted their answers to a small part of the cycle, or showed that they had not prepared themselves properly because they did not know the names of the bacteria involved or incorrectly named them.

Some gave a rudimentary diagram but made no attempt to annotate it.

Option 7(b) was attempted by fewer candidates and most of those who did attempt it gave a sketchy answer. The quality of written communication was an issue for a number of candidates. There was also poorly drawn diagrams and poor use of diagrams, barely labelled, even though rubric reminded candidates to annotate diagrams. There was some confusion about the deference between penicillin and *Penicillium* which was frequently referred to as a bacterium.

BIOLOGY / HUMAN BIOLOGY

General Certificate of Education

Summer 2011

Advanced Subsidiary/Advanced

Principal Examiner: Dr C Blake

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
BY5	3672	80	51.5

Grade Ranges

A	61
B	56
C	51
D	46
E	42

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

BY5

General Comments

It was very rare to find questions not attempted on the paper and there was a good range of marks with several scoring in the seventies. Some responses lacked precision and were sloppy and, in consequence, marks were lost. Handwriting and spelling (especially of scientific terms) seems to be deteriorating often, to a point were no benefit of doubt can be given.

Q.1 This question was designed to be the easy start to settle candidates, but in many cases was a disaster.

(a) Large numbers of candidates had no knowledge of these ecological definitions and had to revert to scanning the memory banks to find a scientific term which seemed to be appropriate. Many reverted to the use of hybrid terms and even more to invention.

(b) Quite poor responses again, good candidates did state gross primary productivity but many candidates stated 'net primary productivity', 'productivity', photosynthesis' and, not uncommonly, 'respiration'.

Q.2 (a) The construction of a table to show the differences between biological structures seems to be a scientific skill which has been lost. It was very rare to find a candidate who obtained full marks in this section. Marks were lost by sloppy responses showing very little care of thought, for example, 'large coloured plants, small green plants, anthers outside of plant, anthers inside plant.' Candidates failed to put comparative features next to each other in the table and, in many cases, ignored the table format and wrote mini essays in each column.

(b) Good responses; the only common error was to state lack of variation, not genetic variation.

(c) Most candidates referred to adaptations in the pollen grains which allowed insect and wind pollination. Reference to the exine were common, but there were few references to the ability to avoid dehydration and it was rare to see reference to the growth of the pollen tube.

(d) Most candidates were able to state that the fruit came from the ovary and the seed from the ovule. Commonly the embryo was derived from the endosperm and the testa from a structure which was barely legible.

Q.3 (a) (i) Good sound responses by most candidates, but there were some who thought that it was a monohybrid cross.

(ii) Phenotypes and ratios usually correct (bizarrely even if the candidate failed to fill in the Punnett square correctly). Some candidates gave all ratios as a fraction of 16, which was acceptable, but others as fractions of 13ths, 4ths and many others!

(b) The question on natural selection was much better and more logical than on previous occasions but candidates did lose marks by not linking theory to the specific example. It was not uncommon to read an answer with no mention of cattle, coat colour or solar radiation.

Q.4 (a) Candidates did identify the members of the canine family which were the same species as the dog. Most gave the correct reason but commonly answers were incorrect because there was no reference to interbreeding.

(b) Most candidates did get two other pieces of evidence which would confirm that they were members of the same species, but answers in many cases lacked scientific precision; for example, 'they all have ears, legs and fluffy coats' is not quite the same as similar morphology.

(c) (i) Large numbers of candidates incorrectly gave the names of all three types of Jackal.

(ii) Very good responses, except from a small number of candidates who gave some form of geographical isolation.

(d) There was a wide range of responses to this question from the bizarre to well structured and well argued impressive account.

Q.5 (a) There was some confusion between a DNA molecule and a DNA strand, but the majority of candidates responded well to this question.

(b) (i) Good, but some incorrect responses such as, bases, nucleotides and amino acids were given.

(ii) This question required some thought but we were pleased by the number of candidates who were able to give two correct controlled variables.

(c) (i) Usually well argued, but the weaker candidates found it difficult to explain in exact terms. Few candidates explained what banding pattern would be expected if there was conservative replication.

(ii) Only the A grade candidates were able to get the correct distribution and the correct proportions.

Q.6 (a) (i) Transcription and translation were often the wrong way around and several candidates incorrectly gave translocation for translation.

(ii) Most candidates achieved 6 marks or more for this question, but 8 was rare.

(b) It was very rate to see a correct answer here, the sequence of nucleotides on the mRNA being given.

Q.7 (a) (i) As expected, a wide range of marks but spermatids normally correct.

(ii) Candidates lost marks here through inaccurate spelling, but apart from those who considered that it produced testosterone, the function given was correct.

(b) Mitosis was the common answer with only a few giving meiosis as the incorrect response. Only about half of the candidates were able to suggest why there were more spermatids than primary spermatocytes.

Q.8 (a) Weaker candidates tended to answer this question, answers were sound, factually good and statements usually were qualified.

(b) The most popular choice of essay, usually factually correct and answered in full with well structured responses. Centres are to be congratulated on the excellent teaching of this difficult topic.

BIOLOGY / HUMAN BIOLOGY

General Certificate of Education

Summer 2011

Advanced Subsidiary/Advanced

Principal Examiner: Mr K Davies

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
BY6	3506	50	38.6

Grade Ranges

A	42
B	38
C	34
D	31
E	28

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

BY6

General Comments

It had been anticipated that in its second year, the performance in BY 6 might well show some improvement. It was pleasing to see that the performance exceeded this and showed a significant increase in the overall mean for the cohort of candidates.

We would like to think that the information supplied via guidance notes, INSET meetings and general feedback, contributed towards this. Statistical analysis for the BY6 however, did show that on paper they should be a stronger group of candidates (based on their GCSE results), so this may have also have been a contributory factor.

The introduction of our report answer booklet seemed to make a big difference this year, not only in the ease of keeping a candidates work together, but also in indicating to candidates the required length of responses. There were a number of candidates who used more than one script; this should not be encouraged as a norm. Many candidates showed that they were able to give excellent responses and gain high marks whilst still only using one script.

Once again, there was a mix of investigations submitted this year. The usual suspects were visible in numbers, but it was nice to see some variations on a theme. A number of fieldwork investigations were submitted and centres should note that there is a second version of the mark scheme for this unit which has been specifically tailored towards fieldwork. There is always the question; which will score the candidates most marks, laboratory based experimentation or fieldwork? In answer to this, performance was not dependent on the investigation, but on the candidates ability to access the marks. This may have been down to ability or the training that candidates were given.

It was pleasing to note that following the comments in last year's examiners report the investigations based on work solely from AS content were in the very smallest of minorities.

It was noted that the use of Appendix 5 was far more widespread and that generally the work that candidates submitted was very well presented. This made the whole process of marking the work far easier – thank you. There were still a few candidates who did not adhere to any kind of scheme; this markedly decreased their ability to access the marking points. One worrying fact brought to my attention in this aspect was that a very small minority of centres had evidently given the candidates the general mark scheme rather than Appendix 5. It has been quite clearly stated that candidates should only have access to Appendix 5 during the duration of the investigation, i.e. no other material (including the general mark scheme) and that the whole exercise is to be done under examination conditions. I will draw your attention to a comment I made last year regarding a booklet commonly known to examination officers as I.C.E. which gives detailed instructions for this type of closed book examination scenario.

Marking point (h) of the Analysis requires that the results are produced in a safe manner and are within tolerable parameters. I think that the evolution of the answer booklet has safeguarded this mark for a number of candidates. In essence we, as examiners, will accept a teacher signature to indicate that the results have been produced in a safe manner and are within tolerable parameters as tested by you the teachers – and we will therefore award the mark. If the work is not counter-signed by teachers then we will not award the mark.

Q.2 **Experimental design**

The mean mark for this section was 9 out of the available 11. This suggests that the marks were accessed well by the candidates. Marks not gained in this section were down to a whole range of simple errors, including:

- not identifying 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, i.e. not giving a reason for carrying out a control experiment

My comment last year regarding the use of 'rate', has reduced the practice of the term, without justification. In respect of this I reiterate my comments from last year; for those candidates who offer answers with the term 'rate' but include no substance or validation of the term will commonly gain 0 marks.

The examiner's report 2010 stated – "Identification of the main hazards was completed appropriately, but there are still some centres that do not select an appropriate hazard and continue to generalise in terms of laboratory safety, something my year 7 pupils could do equally well." This is still the case with some candidates (or centres) lacking accuracy in respect of identifying an **appropriate** hazard as opposed to a general one.

Q.3 **Results**

This was the section where the majority of candidates accessed the majority of their marks. This really is no real surprise as the production of tables and graphs is almost second nature work for these candidates for several years. For those candidates who did not access the full marks in this section; it was usually due to simple errors, many of which I highlighted in detail last year, but there was no real trend to the errors. Many candidates would have improved their marks if they had checked their work thoroughly.

Some candidates submitted tables of substandard quality. Examples include crossed-out lines, extra rows added in, random column widths (with some too narrow to write any number in) or missing a column and having to draw a whole new table.

I suggest a simple model for producing tables, as shown below. Use of this kind of table will be sufficient for the majority of investigations and can be varied accordingly.

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

Other points that should be noted include:

- No units should be within the body of the table
- If seconds are the units for the dependent variable, then only whole seconds to be noted in attempt 1, 2 and 3.
- Mean and Rate should be recorded to no more than 2 decimal places and the number of decimal places should be constant

Q.4 **Analysis**

This once again proved to be the most demanding part of the whole investigation and rightly so. The work needs to be accurate in terms of knowledge drawn from several aspects of biological/investigative work and it is probably physically demanding for the majority who have rarely written a similar quantity of work (except for perhaps BY3). The organisational skills required to keep track of what they have written and where they had written it proved to be taxing for a number of candidates.

If there was an area that showed the greatest improvement, then it would have to be the explanation using biological knowledge. In many cases they were far more detailed than previous, often including the keywords associated with the aspect being studied. They were also more complete, i.e. they discussed most/all of the ideas in a particular concept. Most pleasing and perhaps the biggest jump in performance was seen in those candidates who explained the observations that they had made, i.e. discussing how far the evidence went to support their knowledge and not discussing what they think should have happened (even though it was contrary to what they had found).

Q.5. **Further work**

This section still seems to offer quite a challenge for a significant number of candidates at all levels. Marks were initially lost when the candidates described how they would refine the independent variable that they had used earlier in the investigation. Once again to avoid a penalty here candidates must identify a completely new independent variable. The rest of the work in this section tended to gain marks, although the accuracy required to gain 2 marks for the suggestion of expected results was sometimes missing. It is acceptable to draw a graph to show what they think might be the likely outcome, but it must be adequately labelled in order to gain credit.

One final thing noted by a couple of the examiners was that they saw candidates offer a completely different investigation at this point, perhaps initially studying a yeast respiration practical and then going on to offer details of an Elodea photosynthesis practical. The mark scheme only asks for the independent variable to be changed with subsequent change of a control variable.

Q.6 **Microscopy**

Performance in this aspect was by far the most varied. I commented last year that some candidates were fortunate that the quality of the drawing was not assessed, I now feel on this year's evidence that this might not be the case. The quality of the drawing will not be assessed in this current mark scheme, but the poor quality of drawing witnessed by some candidates obviously led to problems further down the line. Labelling became an issue for some as the lines drawn to indicate different tissue areas were missing and therefore labelling became incorrect. The drawing of the line to indicate where measurement had taken place is in essence a simple mark, but the heavily sketched lines in some drawings made this very difficult to interpret and therefore it was usual for a candidate not to gain the mark. A further point was that candidates tended to finish label lines at the boundary line of a particular tissue, that is not the convention and the label line should finish within the particular region of tissue.

As an examining team we were particularly vigilant when it came to the units of calibration. There were some wonderful interpretations of the symbol to depict micrometer, µm. It was evident that a significant number of candidates were unable to draw this symbol correctly.

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. It is disappointing that varying methods are still being seen and that when used do not meet the mark scheme criteria. The recommended method is shown in the current Teacher's Guide.

Some comments made generally by the examining team included:

- Candidates often referred to "digital" water baths when they actually meant electronically controlled
- The use of English (or Welsh) was often so poor that credit could not be given. Candidates need to understand that spelling, grammar and punctuation matter.
- Handwriting in some instances was so poor that credit could not be given
- 'Tippex' (or any other form of correction liquid) should not be used.
- No highlighters or coloured pens should be used.

Some **misconceptions** noted this year during the marking were:

- The word "optimum" being synonymous with "highest"
- Temperature is **controlled** with a thermometer
- Using "independ**A**nt" rather than "independ**E**nt"
- Changing the dye used in respiration practical will make the results more reliable
- pH meters will accurately keep the pH at the optimum
- Filaments/Vascular bundles in anther drawings are the same thing
- "Anonymous" means the same as anomalous

BIOLOGY / HUMAN BIOLOGY

General Certificate of Education

Summer 2011

Advanced Subsidiary/Advanced

Principal Examiner: Mr G Rowlands

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
HB2	1209	70	34.4

Grade Ranges

A	46
B	41
C	37
D	33
E	29

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

HB2

General Comments

Well prepared candidates from a minority of centres achieved good scores. However, the general standard of the candidates was disappointing. Nevertheless, most candidates attempted all the questions and there were very few 'nil responses'. All the points on the mark scheme were accessible.

Q.1 Candidates would be expected to achieve high scores on an opening question where the basics of classification have been asked in a similar format in past papers. At this level candidates are expected to know the definition of species and the features of the five kingdoms, details of human classification and to name a biological technique such as DNA hybridisation. However, there were many disappointing answers.

Q.2 (a) (ii) It was rare to find a correct definition of 'absorption' with a reference to the three components 'digested products', 'gut wall' and the 'blood stream'.

(b) (i) The present specification emphasises a more general aspect of enzyme action and function rather than a memorisation of a list. Candidates from some centres were able to explain the function of endo- and exo-peptidases whereas candidates from other centres made vague references to them.

(ii) Surprisingly few candidates were able to follow the instructions required to complete the figure.

(c) (i)&(ii) Although some candidates realised the coeliac disease involves a reduction in surface area and consequently a reduction in uptake, extremely few appreciated in (ii) that catalytic surface is also reduced.

Q.3 In (b) most candidates incorrectly took the view that blood pressure could result in the rupture of blood vessels and that the possession of a muscular layer counteracts this. Few stated that a reduction in blood pressure is achieved when arteries divide into arterioles and capillaries with the consequent increase in cross sectional area and that this lowered pressure enables more time for the exchange of materials.

Q.4 This question was very poorly answered.

(a) The majority of candidates merely stated that the bacteria were either Gram positive or Gram negative with no reference to the difference in the structure of the cell wall.

(b) It was rare to find statements such as '*Penicillium* produces the antibiotic penicillin which diffuses out inhibiting bacterial growth to varying degrees'. Most described the degrees of inhibition only with reference to terms such as difference in length and that the bacteria were killed close to the fungus.

(c) Better candidates understood how penicillin destroys bacteria through the inhibition of an enzyme involved in cell formation.

Q.5 As a whole, this question was well answered although a full definition of an antigen was achieved by relatively few candidates.

Q.6 Generally well answered. However, in (a) most candidates failed to appreciate that the function of memory cells is to enable a **rapid** immune response.

Essays

Question 7(a) was by far the more popular of the two questions. Weaker candidates tended to make rather vague statements about asthma with reference to 'the constriction of trachea and bronchi' rather than bronchioles. Better candidates tended to answer 7(b) and there were some excellent responses reflecting a good understanding of the two diseases cholera and tuberculosis.

BIOLOGY / HUMAN BIOLOGY

General Certificate of Education

Summer 2011

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
HB4	77	80	47.4

Grade Ranges

A	58
B	54
C	50
D	46
E	42

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

HB4

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 all three marks for part (a).

(a) (i) Some candidates failed to label the base or labelled it incorrectly.

(ii) The most common errors were 'andenine triphosphate' and 'andenosine triose phosphate.'

(b) (i) There were some very poor drawings despite only having to copy them from part (a).

(ii) Most candidates were able name an intracellular energy requiring process for part (b) (ii).

(c) (i) The table was correctly completed by fewer candidates than expected, apart from not getting the numbers of molecules right, many candidates did not describe both matrix and mitochondria for **precise** location

(ii)&(iii) Were generally well answered.

(d) There was some confusion with anaerobic respiration in animals, with 'lactic acid' being given quite often.

Q.2 (a) (i) There was some confusion of X with Y, some candidates got ATP – ADP or $NADPH_2$ – NADP the wrong way round, some gave NAD instead of NADP. There was also confusion where candidates attempted to use the $NADP^+ + H$ convention.

(ii) Most candidates knew that X and Y were made during the light dependent stage.

(b) There was some uncertainty about how to calculate yield of glucose molecule from the Calvin cycle in part (b).

Q.3 (a) The quality of drawings of the neurones in a reflex arc was generally poor. Very few candidates were able to correctly locate the sensory and motor neurone within the dorsal and ventral routes, hardly any put the cell body of the sensory neurone in the root ganglion. A small minority did manage to put the relay neurone in the grey matter, though even then not always across one side.

(b) Quality of written communication was an issue with many candidates. Some gave an answer relating to synapses but often inaccurate or vague, very few were able to describe the effect of the refractory period.

(c) (i) There was a great variation in the quality of drawings of an action potential, though most candidates were able to indicate the correct values for resting potential and peak action potential.

(ii) Correct labelling of 'depolarisation' and 'repolarisation' was relatively less frequently correct.

(d) Most candidates knew that the pumps are proteins but fewer gave phosphlipids for the bilayer (ii) and (e) required good English and orderly presentation so poor quality of written communication sometimes cost candidates the marks.

There was some confusion with the role of calcium ions in part (c), some candidates described them crossing the synaptic cleft and binding to the post synaptic membrane.

Q.4 (a) The majority of candidates scored at least 1 mark for each of parts (a) (i) – (iii). Fewer scored both marks for (ii) because of confusion about the nature of the bacterial cell wall or (iii) because they failed to explain that facultative anaerobes respire more efficiently in the presence of oxygen.

(b) Most candidates were able to distinguish between total and viable count in part (i). Part (b) (ii) was not well answered. Many candidates appeared not to understand the instruction to 'annotate' and restricted their answer to some labels. (This is consistent with candidates not annotating diagrams in question 7, even though they are explicitly directed to do so.)

Part (b) (iv) was not well understood. Many candidates gave another description of the serial dilution and few described the need to inoculate plates with a measured volume of the diluted samples. Frequently candidates omitted to say that the agar was nutrient agar or described nutrient agar plates as 'Petri dishes'.

Q.5 Most candidates were able name the phases of a growth curve in part (a) though there was some confusion between log. and lag phases. Also, in (b) (i) most candidates knew that the curve went down if death rate exceeded birth rate but there was some very inaccurate labelling. Usual problem with quality of written communication in (b) (ii) (iii) and (iv) with candidates' answers difficult to read or make sense of.

Some poor answers given to parts (b) vague answers like 'better living conditions' are not acceptable at this level.

Q.6 (a) The majority of candidates were able to name a nephron.

(b) (i) Almost all candidates correctly identified the parts A-F though there was some confusion about proximal and distal convoluted tubules.

(ii) Relatively fewer candidates were able to correctly describe the function of the loop.

(c) Most candidates were able to name the hormone in part (i) and the endocrine gland in part (ii), but in part (iii) fewer recognised the wall of the collecting duct as the effector, nor how the hormone changes the permeability in part (iv).

Most candidates were able to name at least two treatments for kidney damage and give simple descriptions, there was some confusion about peritoneal dialysis.

Q.7 (a) This was the more popular choice. A range of marks were awarded. Some candidates clearly and systematically described how the various forms of nitrogen compounds were converted from one to another and gave the names of the bacteria involved in those changes, scoring maximum marks. Some candidates restricted their answers to a small part of the cycle, or showed that they had not prepared themselves properly because they did not know the names of the bacteria involved or incorrectly named them. Some gave a rudimentary diagram but made no attempt to annotate it.

(b) This was attempted by fewer candidates and most of those who did attempt it gave a sketchy answer. The quality of written communication was an issue for a number of candidates. There was also poorly drawn diagrams and poor use of diagrams, barely labelled, even though rubric reminded candidates to annotate diagrams. There was confusion about the role of calcium ions and candidates are well advised not to try to explain the mechanism in terms of troponin and tropomyosin since it is not required at this level

WJEC
245 Western Avenue
Cardiff CF5 2YX
Tel No 029 2026 5000
Fax 029 2057 5994
E-mail: exams@wjec.co.uk
website: www.wjec.co.uk