WJEC
CBAC

# GCE EXAMINERS' REPORTS

## BIOLOGY / HUMAN BIOLOGY
## AS/Advanced

## SUMMER 2010

**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.


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**BIOLOGY**

**General Certificate of Education**

**Summer 2010**

**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 | 3731 | 70 | 29.6 |

## Grade Ranges

| | |
|---|---|
| A | 41 |
| B | 36 |
| C | 32 |
| D | 28 |
| E | 24 |

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

## BY1

Many candidates found the paper challenging particularly the structured questions. However, there were large numbers of candidates who have not made the transition from GCSE to AS level in their construction of answers and they possessed a very insecure knowledge base to bring to the examination. There was a marked reluctance to go beyond one word answers in dealing with questions worth only one mark and so, failed to give a full explanation. Significant numbers of candidates achieved marks in single figures or in the low teens. It was often only the marks awarded for the free response question that enabled many candidates to achieve a passable total.

**Q.1** Many candidates failed to follow the instructions of placing ticks **and** crosses, simply using ticks and leaving a blank where there should be a cross. Candidates will be penalised if instructions are not followed. Only about half of all candidates achieved maximum marks for this first question with features two and three causing the most difficulties.

**Q.2** Candidates' knowledge of collagen was usually, either scanty or non-existent. Only 2(a)(i) was answered with any degree of confidence. Few candidates were aware that the structure of the molecule is of three polypeptide chains bound together tightly. There were many references to the structure being rope-like and a whole list of chemical bonds was usually given as a means of holding the chains together, presumably in the hope that the Examiner would choose the correct bond.

Few candidates were able to express the point that collagen is a structural protein in answer to part (a)(iii). Instead, the Examiners were treated to descriptions of botox treatments.

The inability to express points clearly and a failure to appreciate that in describing differences, both molecules have to be included, led to poor performances in the answers to part (b)(i). Statements such as 'haemoglobin has a haem group', whilst correct, says nothing about the lack of a haem group in collagen. There were many references to collagen and haemoglobin consisting of a number of proteins, rather than polypeptide chains.

Despite part (b)(ii) asking for a **type** of globular protein, many candidates gave a specific example.

**Q.3** Candidates found great difficulty in applying their knowledge of enzymes to answer the questions. Part (a)(i) was usually well answered but, there were far too many references to 'collisions' rather than successful collisions between enzyme and substrate and many candidates omitted the word 'kinetic' when referring to increased energy levels.

Part (a)(ii) was poorly answered with most candidates only scoring one mark for a reference to, or a description of enzyme denaturation. Few candidates identified the fact that some product was formed because of an initial high rate of activity and few made reference to much of the substrate remaining unconverted.

Many candidates recognised that all of the substrate had been converted in part (b) but many incorrectly made references to all of the active sites being occupied by substrate molecules.

Although in answer to part (c) many candidates were able to comment correctly on reduced levels of successful collisions or fewer enzyme substrate complexes being formed, few completed the answer by referring to unreacted substrate being present after 60 minutes.

**Q.4** This question overall, was poorly answered with few candidates understanding the principles of the working of a biosensor. Part (a)(i) was well answered with most candidates giving two advantages. However, a significant number of candidates made reference to immobilised enzymes being able to withstand 'a variety of conditions' but, failed to elaborate upon those conditions. The answers to part (a)(ii) often simply repeated the stem of the question rather than make reference to interpretation of colour changes being judgmental and not quantitative.

Few candidates could state accurately what was meant by the term 'biosensor'. The use of the word 'molecule' was uncommon and few made reference to the generation of an electrical signal/impulse.

The answers to part (b)(ii) were often couched in the terms of a general definition of an enzyme rather than assigning a specific role to the enzyme in the biosensor. Interpretation of the diagram of the biosensor defeated most candidates with answers being very vague, generalised and not logical in the processes described.

**Q.5** Part (a) caused the usual problems associated with a comparison question in that, despite a table being provided to help candidates, many chose not to compare like with like. Instead, in one column, reference would be made to the number of mitochondria and in the next column there would be reference to another structure altogether. Candidates that answer in this way will not be given any credit as this is not an appropriate comparison. The term 'villi' was used often instead of microvilli and many candidates thought that the vesicles were really lysosomes despite the stem of the question stating that cell X is a secretory cell.

Few could give the function of component A as being to transport its contents to the cell surface membrane despite the diagram being a clear guide to its role. The functions of part B and C were better known though in the case of C many talked about 'creating' or 'producing' energy which is clearly incorrect.

Most candidates could name the term exocytosis though there were some who thought that it was endocytosis and, pleasingly, many could describe the fusion of the vesicle membrane with the cell surface membrane.

**Q.6** Most candidates could state the role of a mitochondrion as being the site of aerobic respiration. Interpretation of the data from the table was more problematic. Although most candidates identified differences in energy release (though a significant number referred to lipids being a better energy store), a common mistake was a failure to qualify the data with an appropriate use of units. For example, a simple statement that more energy is released from lipids is imprecise; the reference should be for a unit mass of lipid and carbohydrate. The same is true for the disadvantage of greater oxygen usage. There was often a failure to refer to the oxygen being required for respiration.

The answers to part (b)(ii) were characterised by a lack of detail. For example, many candidates cited a reason as being 'for insulation' without any reference to thermal or electrical insulation. Another common incomplete answer was 'protection' without any detail of what was being protected and the nature of the protection.

Similar issues arose with the answers to part (c)(i) where many candidates stated in response to the question asking for uses of proteins in a growing plant, that it was used for growth. Little imagination was used by the vast majority of candidates in supplying appropriate answers.

The definition of hydrolysis was often underdeveloped with a common omission being to explain how a molecule of water is chemically inserted to break a bond. The majority of candidates simply 'added water' which could imply they were seeking to dissolve the molecules.

The hydrolysis products of starch and protein were well known though some candidates shot themselves in the foot by giving beta glucose as the final product of starch hydrolysis.

**Q.7** Questions about water potential cause problems for candidates and this one was no exception. Few candidates recognised that a practical problem in obtaining a blood sample would be the clotting of the blood or the possibility that it might be infected. Instead differences in the composition of the blood and its water potential were given as reasons along with a few ethical issues.

The answers to part (a)(ii) often omitted a comment explaining that water has the highest water potential and that this would be the cause of the rapid movement of water, though many did state simply that it had a water potential of zero. Only a minority of candidates made any reference to the movement of water by osmosis. There was however, an alarming tendency for candidates to describe a water concentration gradient or water concentration. This is not acceptable at this level and will not be given any credit.

The answers to part (b) often started with the drawing of a plasmolysed plant cell and not a red blood cell. Where a red blood cell was drawn it often was shown with a nucleus present and no credit was given.

**Q.8** Question (a) on the cell cycle was by far the more popular question with well over 90% of candidates answering it. This question often allowed a poorly performing candidate to at least scrape together a modicum of marks and a maximum of ten marks was often awarded. Several common errors emerged. Firstly, DNA replication was often described as doubling or terms other than replication used. Some candidates confused centromeres and centrioles with few candidates describing the joining of the chromatid pair at the centromere. The term 'equator' proved difficult for some candidates who insisted on referring to the middle/centre of the cell. Many candidates had the centrioles/chromatids moving to the 'ends' or even worse, 'sides' of the cell rather that use the term poles. Candidates' knowledge of cytokinesis was often limited to the word itself.

It is difficult to make really meaningful comment on question (b) as so few were seen. However, the marking points that occurred in the majority of answers were C to J inclusive, the others were either seen very rarely, or not at all.

**BIOLOGY**

**General Certificate of Education**

**Summer 2010**

**Advanced Subsidiary/Advanced**

*Principal Examiner:* Mr B Hughes

## Unit Statistics

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| Unit | Entry | Max Mark | Mean Mark |
|---|---|---|---|
| BY2 | 5079 | 70 | 36.0 |

## Grade Ranges

| | |
|---|---|
| A | 49 |
| B | 44 |
| C | 39 |
| D | 34 |
| E | 29 |

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

## BY2

**General Comments:**

The paper allowed candidates to access all 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.

**Comments by question:**

**Q.1** A substantial majority of candidates were awarded all three marks for part (a). In part (b) (i) some candidates incorrectly described the apoplast pathway as 'between gaps in the cell walls'.

**Q.2** Some very poor drawings in part (a) (i), only the best prepared candidates were able to show both the shape of the guard cells and the relative thickness of the walls.

A surprisingly large number of candidates gave the incorrect response 'mitochondria' for part (ii).

In part (b) most candidates were able to describe the advantage of closing the stomata at night to reduce water loss, many fewer were able to describe the link between light, photosynthesis and carbon dioxide uptake.

Part (c) was generally well answered, but there was some confusion about how potassium ions entered the guard cells and lots of candidates omitted reference to osmosis.

**Q.3** Most candidates were able to describe an unusual feature of a red blood cell in part (a) (i), however, some candidates then gave an advantage of different feature or gave a vague answer to part (a) (ii).

Part (b) was correctly answered by almost every candidate.

Part (c) was generally well answered but in (iii) poor quality of written communication sometimes cost candidates the mark.

In part (d) (i) the majority of candidates correctly drew the curve for a llama. A very small number drew the curve to the right of A, and a smaller number drew a curve showing higher maximum saturation. In part (ii) most candidates scored one of the two marks available, only the better candidates referred to the higher affinity of haemoglobin AND related that to low partial pressure of oxygen at altitude.

**Q.4** Overall this question was very well answered.

The majority of candidates correctly named the phylum in part (a), however a number gave Animalia as an answer, so showing lack of preparation.

In part (b) there was some confusion between genus and species in (iii) with a number of candidates giving 'vitulina' as an answer.

There was some confusion between homologous and analogous structures in part (c) (i) and whilst the majority referred to a common ancestor in (ii) some gave vague answers relating to 'adaption'.

Almost all candidates answered both parts of (d) correctly.

**Q.5** Part (a) was not well answered. A significant number of candidates were not able to distinguish between mitosis and meiosis in this context.

The majority of candidates correctly identified X and Y, haploid and diploid in part (b).

Quality of written communication was a problem for a significant number of candidates in part (c) and (d).

The link between variation and ability to survive change was clearly described by a minority of candidates only, for the 2 marks in part (c) (ii).

In part (d) (ii) some very vague answers were given. Typically candidates did not refer to a particular stage in development so it was not possible to tell whether they were describing gametes or embryos or something unrelated.

**Q.6** In part (a) (i) most candidates correctly identified the modes of nutrition of P and Q, though some got them the wrong way round. A small number did not understand the term 'mode of nutrition' and gave 'plant and animal' as their answers. Quality of written communication was a problem in (a) (ii). At this level candidates are expected to know and use the technical names of the types of teeth, too often it was not possible to tell from what was written if the candidates were referring to the correct teeth.

Relatively few candidates referred to both the need to digest cellulose AND the ease of digesting protein to get the mark for (b) (i). In (b) (ii) there was confusion about the chambers of the stomach, in particular which is the rumen, and though many mentioned 'mutualistic' bacteria reference was vague or inaccurate. Many candidates linked high protein content of meat to the function of the stomach for (b) (iii), but relatively few were awarded this mark for reference to storage of infrequently eaten meals.

Parts (c) (i) and (ii) were relatively well answered but (iii) less so. Part (c) (iv) was poorly answered with very few candidates being awarded all 4 marks.

**Q.7** Option 7 (a) was the more popular choice. A range of marks were awarded. Some candidates took advantage of the scope to describe adaptations to both photosynthesis and gas exchange giving clear detailed accounts scoring maximum marks. Some candidates restricted their answers to either photosynthesis or gas exchange, some chose to describe only the mechanism for opening and closing stomatal pores (already examined in Q.2 (c)). There was some very careless use of language including 'to make maximum contact with the sun'.

Option 7 (b) was attempted by fewer candidates and most of those who did attempt it gave a sketchy answer. There was some confusion over structure and function and little effort was made to relate structure to function.

As always, in both free response questions, the quality of written communication was an issue for a number of candidates. There were also poorly drawn diagrams and poor use of diagrams, barely labelled, even though the rubric reminded candidates to annotate the diagrams.

**BIOLOGY**

**General Certificate of Education**

**Summer 2010**

**Advanced Subsidiary/Advanced**

*Principal Examiner:* Mr J Dean

## Unit Statistics

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| Unit | Entry | Max Mark | Mean Mark |
|---|---|---|---|
| BY3 | 6170 | 44 | 29.7 |

## Grade Ranges

| | |
|---|---|
| A | 33 |
| B | 29 |
| C | 25 |
| D | 22 |
| E | 19 |

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

## BY3

It is good to see that practical work has been given a high priority by many centres and this is reflected in the marks that their candidates achieve. The guidance provided by the updated marking scheme, operational from 2009, has been beneficial and teachers better understand what candidates have to do to meet each marking point. Candidates are being encouraged to write their practical work up in an organised manner which, as well as being good practice, makes it easier to spot and award the marks accordingly. It does however need to be emphasised that the level of help given to candidates is clearly explained in the syllabus and some centres are in danger of pushing these boundaries to the detriment of their more able candidates. A minority of centres must remember that the practical component is a “closed” book exercise and that candidates must complete work under supervision in class, and nowhere else, without subsequent amendment. It should also be noted that the work should be written in examination booklets and not on pieces of paper torn out of an exercise book.

### Design

Generally, many candidates did well in this section. However some struggled to identify the two variables clearly and give direction. The most common error was to talk about the rate of the reaction as the variable and to then never go on to use their readings to calculate the rate. If rate is to be used the candidate must refer to rate throughout the practical. It is easier for candidates to achieve the marks throughout the practical by thinking about what it is that they are actually going to record in their results tables. Most candidates seem able to achieve the mark for the relationship between the two variables.

One confusion is still with the units for Hydrogen Peroxide and we have seen % , %volume, vols/% , and many others. If candidates are using hydrogen peroxide, we are expecting ‘vol’ as the unit to be used. Although care should be taken with the terminology as it may be confused with the measured volume used.

Most candidates score well in identifying the variables that need to be controlled during the practical and there has been a vast improvement in the understanding of what a control experiment is.

Hazards and safety in the practical procedure seem to be well understood by candidates and we are only seeing a few bizarre suggestions here.

### Results

This area was pleasing with many candidates achieving full marks. Tables are vastly improved and graphs are very well drawn. Where errors occur they are usually due to candidates forgetting units or choosing non-linear scales.

### Analysis

Again there is an improvement in standard here with many candidates now using their data to explain the patterns and trends. We have however seen some interesting centre based anomalies, for example” Aero” bars being discussed by all candidates as a means of testing the reliability of their results. It is however worth noting that if candidates use error bars they are expected to note any overlaps between the bars as well as comment on the range of the bars.

The use of scientific knowledge is generally good and well linked to the practical that the candidates are actually carrying out. Some candidates need to be reminded that they are expected to draw a final conclusion from the experiment based on either their data, scientific knowledge, or their initial prediction.

Teachers should note that it is vital that they sign the candidate record sheet as this is taken as the necessary evidence that the candidate achieved the expected results in the absence of any teacher comments.

**Further work**

Here is an area that some centres need to train their candidates further and far too many candidates made little attempt at an answer. Candidates often did not achieve well in this area as they did not seem to understand what was expected from them. The updated marking scheme (Teachers Guide October 09) provides clearer marking points.

**Microscopy**

Again there was significant improvement in this area from last year. Many centres are clearly giving candidates more than one opportunity to show their level of skill in this component. However, it is not the role of the marker to select and mark the most appropriate piece for the candidate. In these cases, markers will use the first piece of work and ignore the others. Candidates are now required to mark two measurements on the drawing, note that the lines should be on the tissues and should be drawn accurately with clear endings. The markers measure them and use them as a means of judging accuracy of proportion.

**BIOLOGY**

**General Certificate of Education**

**Summer 2010**

**Advanced Subsidiary/Advanced**

*Principal Examiner:* Ms F Cowie

## Unit Statistics

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| Unit | Entry | Max Mark | Mean Mark |
|---|---|---|---|
| BY4 | 1452 | 80 | 44.3 |

## Grade Ranges

| | |
|---|---|
| A | 57 |
| B | 51 |
| C | 45 |
| D | 39 |
| E | 34 |

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

## BY4

Some excellent scripts were seen showing a good grasp of biological principles and demonstrating the ability to apply this knowledge. The usual problems of not using scientific terminology correctly were seen, as was lack of learning the BY4 work thoroughly. Sloppy, imprecise responses which did not follow the rubric did not gain credit.

**Q.1** was intended to be a straightforward start to the paper and for most this was indeed the case. Many candidates scored full marks and had clearly learned the work thoroughly. The most common error was simply putting respiration or photosynthesis down for (a) (ii) instead of specifying which section of these processes required the conversion of ATP to ADP.

**Q.2** proved to be straightforward for many candidates. Those who had learned their definitions and could describe how the diagram had helped them to come to the correct conclusion routinely scored 6 in (a). The most common loss of marks was due to simply giving a definition of an obligate aerobe etc rather than giving a reason for their answer. Many candidates scored full marks on this question.

**Q.3** This question proved to be one of the most problematic on the paper for many candidates. Complete confusion over what stages occur in which part of the cell/mitochondria was common. If this question had simply been 'Write all you know about respiration,' then it would have been simple recall and would probably have attracted higher marks. However this question required candidates to extract knowledge about respiration and then go on to apply those facts, which many do not have the skills to do. There was much confusion over what cyanide is and its effect on respiration.

**Q.4** Again full marks were not uncommon in scripts showing that candidates had learned their work on kidneys. There is a lot of confusion over how selective re-absorption is carried out and why the Loop of Henle has differing lengths in various mammals. Good responses for (e) were routine, although there was confusion over the role of ADH and with insulin.

**Q.5** (a), (b) and (c) often achieved full marks, but many failed to read (d) thoroughly and subsequently named *Azotobacter* instead of *Rhizobium* in (i) (or made up some hybrid organism). A significant number had legumes with a circulatory system which carries haemoglobin in (ii).

(e) required some comment on respiration and use of oxygen as the final electron acceptor, forming water (and thus removing oxygen from the area), but this was only seen on the very best scripts. There was complete confusion over (f). Having answered an entire question on the nitrogen cycle, some went off at a complete tangent with reference to getting oxygen from the insect or killing the insect before it ate the plant. There is far too much use of the phrase 'nitrogen containing compounds' in the majority of answers as a catch-all term. This could mean ammonium ions/ammonia/nitrites/nitrates/urea/uric acid/proteins/amino acids etc, and it is not for the examiner to second guess which nitrogen containing compounds the candidate is referring to; these must be stated clearly and unambiguously in order to gain credit.

**Q.6** Many scored well on this although worryingly some were left almost completely blank. (a) required some reference to the inter-conversion of the two forms of phytochrome and then the application of this to the three experiments. A simple answer to (c) was rarely seen with many wanting to simply increase yield and growth or allow reproduction.

**Q.7** This question required the application of knowledge to a set of experimental results. Logical, considered responses to (a), (b) and (c), using Calvin Cycle knowledge were rare, although well done in good scripts. The remainder of the question was straight recall and if candidates had learned the work they routinely scored full marks.

**Q.8** Both essays were equally popular although choice of essay tended to be centre-specific. Clearly candidates had prepared their essays well and the answers flowed according to the mark scheme. Very many scored a 10 Max and for a significant number this will have pulled their overall score up considerably.

# BIOLOGY

## General Certificate of Education

## Summer 2010

## Advanced Subsidiary/Advanced

*Principal Examiner:* Dr C Blake

### Unit Statistics

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| Unit | Entry | Max Mark | Mean Mark |
|---|---|---|---|
| BY5 | 3035 | 80 | 52.3 |

### Grade Ranges

| | |
|---|---|
| A | 63 |
| B | 57 |
| C | 52 |
| D | 47 |
| E | 42 |

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

## BY5

The paper seems to have worked well and all questions were accessible to candidates, there were very few 'not attempted' questions and there was a good range of marks. Most candidates had been well prepared and there was little evidence that subject matter had not been covered in the depth required at this level.

**Q.1** (a) Many candidates had apparently not been expecting this and in some cases obviously had to scan their memory banks for answers or even trust to guessing. Spelling was not good but examiners tried to interpret, except for urethra which was often confused with the ureter, we did not see as many prostrate glands as I expected although they were common in some centres! The identification of the seminal vesicles was the most common error, they were identified as prostate glands, mucus glands and in one case Semolina glands.

(b) Responses to this were often much better than section (a) and it was not uncommon to get 0 marks in (a) and all 6 in (b).

**Q.2** (a) I only recall seeing one script where the correct homologous chromosome was not shaded, the correct identification of the cells undergoing meiosis was rare and few gave two, failing to spot that the pleural had been used in the stem. Identification of the haploid cell from the kangaroo and diploid from the mosquito was poor with very few correct responses, candidates seemed unable to appreciate that homologous chromosomes have a similar shape although the clue had been given in (a), this was disappointing.

(d) (i) Responses were usually correct, most candidates opting for comments on the effect on meiosis, in b (ii) there were a significant number of incorrect responses even from candidates who had stated in section (i) that meiosis could not take place.

(e) Excellent responses in section (i) but it was rare to see full marks being achieved in section (ii).

**Q.3** (a) Usually very well done. Some candidates reversed the genotype of parents and gametes, some got the ratio wrong (3.1 and 9.3 3.1. sometimes appearing), some candidates did not appreciate that phenotypes, genotypes and the ratio should relate correctly.

(b) Candidates had been well prepared but many (tended to be centre based) were not able to calculate the correct chi squared value, in the main this was caused by using the totals, an 'error carried forward' was applied in such cases.

(c) Most candidates accepted the Null hypothesis but few could state why or what their calculated chi squared value suggested about the inheritance of flower colour in snapdragons although stated in the stem of the question.

**Q.4** (a) (i) and (ii) almost always correct. Surprisingly section (iii) caused significant problems with many candidates failing to appreciate the significance of start codons. The term mutation was well known but in some cases incorrectly identified as a chromosome mutation. Many vague responses were made to section (v) for example 'no polypeptide would be produced' and 'the wrong polypeptide would be produced'. Only the A/B grade candidates stated that 4 genes were responsible for coding for the haemoglobins in humans, 100 being a popular choice. There were very pleasing well expressed accounts of protein synthesis with most achieving the maximum marks. There were few correct responses to sections 4b (iii) and (iv) with many references to sickle cell anaemia and difficulties matching blood during transfusion.

**Q.5** The question was a good discriminator. A/B grade candidates found no difficulty but there was much more confusion, vagueness and sloppy expression in many responses. Some candidates considered that it involved in vitro fertilisation, somatic cell nuclei were commonly fused or rather put into the embryo and a host of other ingenious but alas incorrect methods. In section (b) there were many references to crossing over, independent assortment, fertilisation and dominant and recessive alleles. Section (c) was slightly better but not well expressed with very few candidates able to give a logical and concise account, responses were long and obtuse but sometimes stumbled upon creditable statements by default.

**Q.6** (a) The function of restriction endonucleases was well understood but some candidates lost the mark through sloppy answers such as 'cut gene' or 'to make sticky ends' or 'add sticky ends'. The function of ligase caused slightly more problems with many references to joining the two strands of DNA back together after transcription. Reverse transcriptase led to many sloppy answers such as converts / changes RNA into DNA. The term, marker gene, was well defined except for those who thought that it indicated where restriction enzymes cut the DNA. PCR was generally good but some thought that it just made a single copy.

(b) (i) Good responses but confused, by some, with genetic profiling. (ii) Most candidates were able to get two correct advantages of the human genome project but an alarming number have been indoctrinated by the popular press and this was also demonstrated in section (iii)

**Q.7** (a) Energy Flow. Candidates found it difficult to express themselves and to give clear concise answers. I am of the opinion that this essay was selected by weaker candidates, who had not revised sexual reproduction in plants. There was not an appreciation of the difference between excretion and egestion and answers lacked the detail required at this level. It was rare to see a script with more that 7 marks on this question.

(b) I would have though that about 75% of candidates opted for this. Accounts were in most cases excellent with large numbers of candidates achieving full marks. Some candidates wasted valuable time and space discussing the features of insect and wind pollinated flowers and all the conditions necessary for germination. Definitions of seeds and fruits are now accurately expressed.

**BIOLOGY**

**General Certificate of Education**

**Summer 2010**

**Advanced Subsidiary/Advanced**

*Principal Examiner:* Mr K Davies

## Unit Statistics

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| Unit | Entry | Max Mark | Mean Mark |
|---|---|---|---|
| BY6 | 3049 | 50 | 37.2 |

## Grade Ranges

| | |
|---|---|
| A | 41 |
| B | 37 |
| C | 33 |
| D | 30 |
| E | 27 |

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

## BY6

The vast majority of centres submitted work for candidates which was of the expected standard and highlighted the ability to correctly interpret the mark scheme as set out in the specification. Indeed the mean score for this paper was generally higher than the old BI 6 scheme. The following comments are therefore not intended to detract from these centres, but to address some of the more worrying tendencies observed and to clarify particular grey areas.

Before perhaps going into particular question by question detail, there were several investigations seen that did not allow candidates to access the full range of marks as per the amended mark scheme which has been updated for sometime on the WJEC website and is to be found in the latest version of the guidance notes. Another problem that impeded access to the full range of marks was the use of an investigation which was clearly AS content in nature e.g. osmosis; counting bubbles (the latter arguably being more GCSE).

The specification clearly states that the work should be commensurate with A2 and therefore "inherently involve slightly more complex and demanding activities for candidates at A2". To the other extreme we have seen centres where each candidate has submitted several examination answer booklets. Perhaps the extreme was one centre where all the candidates had completed nearly 3 12 page answer booklets, that is 36 or so pages of writing. Clearly a balance should be sought, as remembering the volumes of information these candidates had to write must have been a mammoth task, especially as investigative work is now a closed book exercise. This therefore does not allow the use of any prohibited material as outlined by the JCQ guidance posters and the I.C.E. (Instructions for Conducting Examinations) booklet which gives detailed instructions for this type of closed book scenario.

### Q.1 Aim/Prediction

This saw a move away from the quantitative/qualitative marking seen in the legacy Bi 6 to an approach adopted in the BY 3 form of assessment. It was rare not to gain 2 marks from this question as the majority of candidates stated clearly that the effect of changing the value of one variable went on to determine the value of another, i.e. linking the variables correctly. Indeed most candidates continued to give what was quite clearly a quantitative prediction and evidently were able to discuss this question with ease. Only some candidates gave a list here with no apparent 'link' between the variable values they were discussing and therefore were restricted to 1 mark. "Rate" was a term used with great frequency in this question and it did rightly have a place in the marking if the candidate had in question 3 calculated a rate of some description. Therefore linking a variable and its effect on the 'rate', with a rate calculated in the table, gained 2 marks. However, if 'rate' was just freely used and no evidence of a calculated rate being given there were 0 marks available to the candidate. Fortunately this was a rare scenario, and one I suggest is avoided, as examiners will check the entire script for evidence of a rate being measured/calculated before awarding the mark.

## Q.2 Experimental design

Evidently advice given in last years BY 3 report which highlighted the practice of giving variable details in the scenario has been heeded and candidates gained good marks here. Some centres neglected to include the required scenario sheets given to their candidates. This is a requirement that must be met by the teacher in charge and he/she must ensure that this sheet is included with the scripts as part of the documentation (and not sent as an afterthought). There has been no direct penalty this year, but I envisage sanctions being enforced on those centres that do not include it next year. It may have lead to some candidates being penalised indirectly, however, as the marker was left to make assumptions about the information which had been given to candidates.

The identified variables were good with suitable clearly stated ranges for the independent variable and dependent variables. 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. This leads me into the use of Appendix 5 of the Guidance Notes, which I can only perceive to be a valuable allowed aid for the candidates. If nothing else it serves as a checklist for the candidates to use during the assessment so that they include the necessary detail. Perhaps for ease of presentation, in a commonly accepted order, it helps candidates and examiners alike. There is nothing worse than chasing through a script to find answers which haven't followed the order in appendix 5 if any order at all. And bringing it back to the repeat readings, it was those candidates who wrote in no order at all who commonly lost the mark for repeat reading. It is this appendix 5 and the scenario sheet which are the only two pieces of paper the candidates should have access to – this is a point I will come back to at the end of the report.

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

Some creative answers were engineered for the ecological investigations, but perhaps as the mark scheme allows, indicating why there was no viable control and continuing on to explain the significance accessed the marks. In those centres who used an AS Osmosis practical in tissue samples, a number quoted using 'distilled water' as the control. This obviously is incorrect and missed the whole significance of a control experiment – where the alternative would have been boiling the tissue sample, therefore destroying the semi-permeable membrane and not allowing osmosis to occur.

Identification of the main hazards was completed appropriately, but there are still some centres who do not select an appropriate hazard and continue to generalise in terms of laboratory safety, something my year 7 pupils could do equally well.

### Q.3 Results

This particular section of the work gained the most marks for the whole cohort with total marks generally around 11 or 12. The errors seen here were varied:

- headings lacking relevant significance, e.g. 'time'….. time for what? 'Time taken for 10 $cm^3$ of $CO_2$ to be collected' would be the sort of thing we were looking for.

- Units were either missing altogether or they were included in the body of the table and not in the title. I expect them to be in the title and nowhere else.

- Accuracy of recording, the use of decimal places seems to cause quite some confusion, with some candidates opting for the 'give them everything approach', i.e. writing means to 8 decimal places. I would suggest that 2 decimal places is enough. Recording time seemed not to cause the issues that were previously seen when recording to decimal places. Instead we saw time being recorded in the thousands of seconds. As I can appreciate from personal experience some experiments took a very long time, it is then a question of appropriateness of recording not so much the accuracy. If the time in seconds is very high, a change of unit is advisable. I think this shows an increased level of understanding and sound numeracy skills. Obviously the use of minutes and seconds should be clearly noted as: X min Y sec and not X.Y min.

- No indication of the value at the origin was one of the commonest errors with the graph. This was generally followed by non-linear scales by the same candidates.

- Joining the points with the number of data points collected should really only be a 'join the dots exercise'. Producing a **straight** line of best fit is not possible in most cases and indeed can impede the analysis of data in many cases. There were some prime examples of candidates producing a straight line of best fit, when if they had joined the points, the graph would have shown a nice curve, which was more in line with the biological knowledge. These candidates were therefore making it harder for themselves in the analysis section of the work. The point about the type of line joining plots is that it should be appropriate for the data and not just follow a mindless and arbitrary rule. Candidates need to understand about the ways data can be presented and to look objectively at their data in order to present it in the most appropriate way.

Centres who had ventured into the world of statistics gained very good marks here as well, generally again around the 10 or 11 marks from the 12 available. As in previous Bi 6 stats questions, errors were generally due to incorrect substitution into formulae.

Perhaps the most worrying observation made by a number of my examining team in this section was the use of 'class/teacher results'. There were those few centres who had sought permission from the examining board to use teacher results for one reason or another. But there were also those centres who had not gained this permission and it was evident that the results were a given set or collated group set. This is not to be confused with gaining repeats from fellow candidates due to timing issues [although if this is the case then it should be indicated so at the foot of the table, where the candidates own results are clearly indicated] this is rather an issue to do with every candidates results being the same with no indication as to why. There has been great discussion over this as you can imagine, but please remember that this exercise is designed for candidates to **collect their own results**.

### Q.4 Analysis

The trend in results, use of and interpretation of error bars and suggested improvements were completed in a manner seen in previous Bi 6 papers and continued the good work. There were however differing degrees of difficulty when discussing the reliability and accuracy of the results. This particular part of the work seemed to cause more problems for more candidates than any other part of the work.

Can I suggest when discussing the reliability that candidates look at the repeat readings; checking the range of values at a given temperature for instance. Small range with values close together would suggest reliable results, whereas, wide range with values far apart, even over-lapping other temperature values, would suggest unreliable data.

Some candidates I thought did this very well, discussing the reliability in terms of the error bars, with answers such as:

"I used my error bars as a measure of the data reliability, as the error bars were small and did not over-lap, I am happy that my results are reliable"

The above statement gained 2 marks and those candidates who stated the converse with large error bars, giving evidence of unreliable data also got 2 marks.

The greatest range of marks was seen in the section where candidates were asked to employ sound biological knowledge to fully explain the observations that they had made. Remembering that this is A2, there was an expectation that explanations would be concise and accurate. To be fair there were a lot of this type of explanations given. There were however all other kinds of examples seen:

- explanations that were more akin to descriptions of the graph, therefore a lack of understanding of the terminology was an issue here.

- explanations that stopped at an AS level. For example, explaining 'respiration' type investigations in terms of enzymology only. These answers did not discuss pathways in respiration, no naming of particular respiratory enzymes and no discussion of hydrogen acceptors.

The mark scheme allows for all variation of standard of explanations and marks were generally around the 4 or 5 out of the 6 available. If a candidate wrote an explanation to AS level only then further progress for that candidate was stopped at 3 marks, this tended to be centre based.

It was quite pleasing to see some of the ecological and microbiological work explained in this section with concise answers incorporating all of the information available in the specification.

The only worrying problem seen by the team of examiners across a range of centres was the explanation of respiration in a yeast investigation in terms of anaerobic respiration only. I'm sure to start with that the candidates in those centres did not use a vacuum pump to expel air at the beginning of the experiment, therefore oxygen would have indeed been present and therefore aerobic respiration could have taken place. Secondly, not that this is required learning, but yeast can respire aerobically thankfully and allows us to produce such things as bread ~ hopefully centres who have dealt with the explanation in terms of anaerobic respiration only do realise this. The term that would be used to describe this is of course 'obligate anaerobe'.

Perhaps the section that caused the most problems and scored generally the least number of marks for the most number of candidates was the production of a conclusion from the results and the knowledge they had brought to investigation on the day of the examination. The first point to note is that the conclusion in A2 is worth 3 marks, therefore writing a one sentence answer would not gain anything other than 1 mark, assuming of course that the statement was correct. It would be a fair assumption that 3 marks would require 3 correct statements, that when combined were evidence of a sound conclusion. The statements could pertain to the actual result, perhaps to the confidence in the reliability of the results and how the results fit the accepted biological knowledge. From experience I found it hard to describe the process of producing a conclusion to my candidates, until in a discussion with the group one day, the idea of Venn diagrams came to play in the diagrams we were drawing on the whiteboard and the overlapping at the centre developed into what would be the required conclusion [perhaps at inset I may have the opportunity to elaborate on this further].

Teacher comments are in essence an easy mark for the candidates, a simple signature on the cover sheet allows access to this mark. A signature was not offered by some centres potentially penalising their candidates.

### Q.5 Further work

Candidates generally scored well in this section, unless they fell into the trap of not adopting a new independent variable. It was also observed on a very small number of occasions that an entirely new investigation was planned on a completely different area of the syllabus ~ interpretation of this question was either incorrect or the candidates were drawing information from a practice investigation they had been working on.

The control variable usually scored well gaining the candidates 2 marks. I would however draw your attention to the mark scheme, where in brackets it notes that one of the **new control variables must be different** to those previously offered. A few [enough to draw the examining team's attention] used the exact same control variable and therefore limited themselves to 1 mark here.

A suggestion for the expected results was mostly completed using a sketch graph. If no further information is offered then it is advisable for candidates to label the graph adequately.

## Q.6 Microscopy

Providing more than one drawing for each candidate does not serve any purpose at all. The instructions given to the examining team is to mark the first drawing they come across irrespective of its quality and the quality of subsequent drawings. Samples were drawn from across the entire specification, including specimens from AS, for this year the decision was taken to allow these, however, only specimens relevant to A2 content will be accepted next year. Some centres have adopted the policy of photocopying old BI 3 and BI 6 microscopy questions, this really is not necessary and indeed makes for extra unnecessary work for the candidates for which there are no marks available, although it could arguably serve a training purpose.

The mark gained here was generally good for the majority of candidates, even those who had not scored well in the other 5 sections. Fortunately for a number of candidates the drawing itself does not carry any marks, as the drawings seem to have taken a dip in standard from the standard seen towards the end of the BI 6 examinations. This might have contributed to the loss in labelling marks seen by a number of candidates.

Calculations in the work were correct most of the time and scored good marks. However some calibration techniques are still employed which do not tally to the prescribed method from the WJEC [which has been the same for a number of years] and therefore miss the points in the mark scheme.

Just one final note on the microscopy work, you should only submit unmarked work.

To conclude, for the first run through this new mark scheme for BY 6 the response has been very encouraging, however, attention to detail of the assessment requirements is needed by some.

As usual I am available for further assistance or clarification on any aspect of this report. Should you wish to contact me then you should do so through the WJEC who will forward your details to me, I will then contact you usually via email.

## BY3 and BY6

Points to note when preparing the candidates

- work should allow access to the current marking criteria;
- candidates should carry out their own plan;
- if results are shared, or given for some reason then candidates own results should be identified and the reason why results are given should be stated clearly.
- avoid the use of ‘rate’ unless of course you specifically train them to calculate it;
- encourage them to give units to the independent and dependent variables;
- get the candidates to explain why they repeat experiments as opposed to just saying that they are going to repeat;
- encourage the candidates to reason why a control experiment is necessary;
- tables should have clear headings with units in the title and not the body of the table;
- 2 decimal places is generally sufficient (except some statistical tests);
- remember to have linear scales with the origin labelled;
- ensure they make adequate observations on reliability preferably derived from error bar interpretations;
- make the best possible use of all biological knowledge aiming to be coherent and accurate in its presentation to gain all available marks for the particular section;
- encourage the preparation of conclusions that draw on several pieces of information;
- promote the full description of expected results in the further work, either in a short accurate paragraph or fully annotated graph;
- produce several pieces of microscopy work during the year, selecting the best one for submission;
- on the day(s) of the examination allow candidates access to the scenario sheet and the list of section headings as outlined in appendix 5 of the guidance notes (note nothing else is permissible);
- the report should be written in examination answer booklets;
- redrafting and later amendments of the work is not allowed.

Points to consider before you post 2011 scripts:

- has a cover sheet been attached to each candidate's work and has it been completed and signed?

- have the individual parts of a candidate's work been treasury tagged?

- has a copy of the scenario sheet been included?

- there should be a register of candidates entered for the unit with your Examination Officer, has it been included? [The Examination Officer should also have your address labels]

- to avoid any damage to the scripts they should ideally be sent to the examiner in a script envelope or a course work bag, again available from your Examination Officer. A number of envelopes arrived in a poor state this year;

- work should meet the deadline for submission.

**Additional Point**

Please note that answer booklets specifically for writing the report of BY3 and BY6 investigations are being printed. They will be despatched to centres (examination officers) in October 2010.

These booklets include the cover sheet and graph paper to simplify some of the requirements above.

**HUMAN BIOLOGY**

**General Certificate of Education**

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**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 | 1086 | 70 | 35.1 |

## Grade Ranges

| | |
|---|---|
| A | 48 |
| B | 43 |
| C | 38 |
| D | 33 |
| E | 29 |

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

## HB2

All questions were accessible and well prepared candidates scored highly in both essay questions. Many candidates found difficulty in expressing themselves clearly and often failed to achieve marks due to lack of careful thought and re-reading their responses.

**Q.1** Generally well answered.

**Q.2** Generally well answered although weaker candidate were unable to correctly complete the relatively simple table.

**Q.3** Again, a relatively straightforward question although candidates from some centres had obviously not encountered the terms 'bactericidal' and 'bacteriostatic'. In (b)(i) a description of 'antibiotics diffusing into the agar' was rare, consequently most candidates failed to gain a mark here. In (c) many candidates gave lengthy descriptions of GP's inappropriately prescribing antibiotics to patients rather than a biological reason for resistance. It was particularly worrying in (d) that a large proportion of candidates considered that 'flu and the common cold' are resistant to antibiotics.

**Q.4** Most candidates had a weak understanding of the principles of basic food hygiene. There were many references to 'infections' with weaker candidates failing to use the word 'bacteria' in their responses. In (a)(i) the majority thought that the interval between ingestion and appearance of symptoms was due to the time taken for bacteria to reach the intestines. In (a)(ii) references were seldom made to the production of toxins. In (b)(ii) candidates failed to appreciate that bacteria continue to reproduce in the refrigerator but at a slower rate.

**Q.5** Well prepared candidates scored highly on this question.
However, in (a)(i) weaker candidates merely gave the answer 'white cells' and failed to distinguish between the two types of white cells. Precise identification is essential at this level. Consequently, in (a)(ii) many incorrectly described the function of A as 'phagocytosis'. In (a)(iii) there were also many imprecise responses. In (b) the concept of the oxygen dissociation curve proved to be a good discriminator.

**Q.6** Generally well answered.

**Q.7** The responses to this question were centre-based.
Weaker candidates performed poorly in (a) and had little knowledge of the adaptations of the tapeworm and the malarial parasite. Parts (b) and (c) were well answered but in (c)(ii) very few candidates were aware that spraying oil on the surface of the water affects the breathing tubes of the larvae.

**Q.8** The essays proved to be equally popular and were generally well answered with well prepared candidates often gaining maximum marks. It was particularly pleasing that most candidates had a good understanding of hypertension and were obviously aided in the organisation of their answers by the well phrased question. In the protein digestion option there were many excellent detailed answers but it was surprising that the majority of candidates failed to describe the absorption of amino acids correctly and often described the diffusion of the amino acids into the lacteal of the villus rather than the capillaries.

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## Unit Statistics

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| Unit | Entry | Max Mark | Mean Mark |
|---|---|---|---|
| HB4 | 74 | 80 | 44.9 |

## Grade Ranges

| | |
|---|---|
| A | 59 |
| B | 53 |
| C | 47 |
| D | 41 |
| E | 35 |

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

## HB4

Candidates from some centres were well prepared for the examination. All questions were accessible and it was pleasing that a number of candidates achieved high scores. However, it was apparent that some candidates failed to read questions thoroughly and use the information provided in the question before attempting their answers. It is also essential at this level that candidates need to produce precise but detailed answers where required. Many essays were well below the standard required with weaker candidates being ill-advised to answer the question on muscles.

**Q.1** Generally well answered.

**Q.2** Generally well answered.

**Q.3** In part (b) weaker candidates failed to use the information supplied in the question. In (c)(iii) weaker candidates were unable to distinguish between 'decomposition' and 'nitrification' and failed to explain how ammonia is converted to nitrate.

**Q.4** This question was a good discriminator with well prepared candidates scoring highly. In part (d) weaker candidates gave insufficient detail of precisely how pyruvate was converted to lactate or ethanol.

**Q.5** This question required careful thought and use of the diagram supplied. It was apparent that despite the reduction in the photosynthesis content of the specification weaker candidates continue to experience difficulty with this topic.

**Q.6** A generally well answered question but it was surprising how few candidates were able to calculate the mean number of bacteria per $cm^3$ and gave the mean only. In (b)(ii) few candidates were aware that dishes are incubated at 25ºC to reduce the risk of culturing pathogens. In (b)(iv) even fewer were aware that a temperature of 121◦C is required to destroy any bacterial spores.

**Q.7** Generally very well answered.

**Q.8** Generally well answered although part (b) proved to be another good discriminator. In (b)(iii) most candidates incorrectly thought that lowering the concentration of sodium ions would prevent an action potential taking place. Few realised that the slope of the action potential would be less steep as it would take longer for sodium ions to diffuse in and that the time taken to generate an impulse would increase.

**Q.9** There were some excellent answers from one centre in particular. However, there were many poorly prepared candidates for both topics. It is apparent that there is a need to practise essay skills.

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