



GCE EXAMINERS' REPORTS

**BIOLOGY
AS/Advanced**

JANUARY 2012

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
January 2012
Advanced Subsidiary/Advanced

Principal Examiner: Mr G. Rowlands B.Sc., M.Sc., M.Ed.

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	6208	70	43.4

Grade Ranges

A	52
B	47
C	43
D	39
E	35

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

Biology BY1

The paper acted as a pilot for e-marking. Consequently it is possible only to comment on individual questions and not on the candidates' performance as a whole. The questions proved to be accessible to the majority of candidates with very few 'nil responses'. However, a general failing is the lack of consideration of information, such as diagrams, provided in the questions. These provide useful information which candidates can build upon in their responses. It is apparent that the majority of candidates have a good understanding of the requirements of the specification of this unit.

- Q.1 The opening question on cell structure was generally well answered. In part (c) the function of the nuclear pores was less well known.
- Q.2 Although it was well known that the test for a reducing sugar involved Benedict's reagent many failed to gain marks as they omitted to include details such as the requirement of heat. Many also gave the final colour change but failed to state that Benedict's is blue.
In (d)(ii) most candidates were able to make a comparative statement regarding double bonds and single bonds but failed to mention that unsaturated fatty acids contain fewer hydrogen atoms.
- Q.3 This question proved to be a good discriminator. Many candidates did not expand on the information provided in the simple diagram of part of a cellulose molecule. It was rare to come across statements such as 'hydrogen bonds form between OH groups of β glucose molecules of parallel chains.'
- Q.4 Candidates showed a good understanding and used appropriate terms in describing the effect of temperature and inhibitors on enzyme action. However, it was alarming to find that a large number of candidates were unable to calculate the rate of reaction in the first 10 minutes at 30° C.
- Q.5 The majority of candidates scored highly on this question.
- Q.6 Candidates are familiar with the sequencing of the stages of mitosis. In part (c) candidates were asked to use 'information provided'. Had they done so the simple requirement that the DNA content is doubled and then halved to maintain the DNA content in the two daughter cells would have been apparent. References to chromosome number gained no marks.
- Q.7 Responses showed that candidates had a good understanding of membrane structure and function. Care must be taken with expression as in (b)(i) some candidates failed to gain a mark by stating that 'as lipids became more soluble the rate of diffusion increased' rather than 'as lipid solubility increases....' In (d) candidates did surprisingly well exhibiting good understanding of the different routes that water soluble and fat soluble substances take across the membrane.
- Q.8 The essay on proteins proved to be far more popular than that on immobilised enzymes. In (a) those that answered the question on immobilised enzymes scored highly although the descriptions of biosensors lacked detail at times. In (b) well prepared candidates scored highly on the structure and role of proteins. The majority of candidates described in detail the levels of protein structure. Less well prepared candidates were confused and failed to describe successfully the roles of proteins and neglected to describe specific examples and their functions.

BIOLOGY
General Certificate of Education
January 2012
Advanced Subsidiary/Advanced

Principal Examiner: D r . T . M . M o r g a n

Unit Statistics

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Unit	Entry	Max Mark	Mean Mark
BY2	1299	70	39.5

Grade Ranges

A	52
B	47
C	42
D	38
E	34

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

Biology BY2

- Q.1 This question was intended to be a straightforward start to the paper but a surprising number of candidates made errors in labelling the diagram of the digestive system (mainly labelling the oesophagus as the trachea) and very few candidates were able to identify the main regions of digestion and absorption with most only identifying one region.

The parasitic adaptations of *Taenia solium* were generally answered well but the reproductive strategy of producing large numbers of eggs to increase chance of species survival was often confused with increased chances for fertilization.

- Q.2 The spelling of arthropoda was variable with some candidates losing marks through naming the phylum as anthropoda.

Basic definitions such as the meaning of the term species need to be learned thoroughly; for some time examiners have expected candidates to indicate the need for organisms of the same species to be able to **interbreed** and produce **fertile** offspring. This was not communicated by many candidates.

Most candidates were able to identify a method to confirm a close relationship but there was much confusion over how the method they described would show this relationship – many described various methods of DNA analysis and then described how similarities in their amino acid sequences would confirm a close relationship or otherwise.

- Q.3 Despite students professing to not like plants this question was answered well by most candidates.

It was evident, however, that many candidates do not read the questions thoroughly. Many lost marks through only describing the relationship between wind speed and the distance moved and did not explain as was asked, and by describing the role of ions etc., in the opening of stomata when the question asked for their role in closing stomata.

- Q.4 The standard of answers to all parts of this question was shocking!

The vast majority of candidates were unable to give a simple explanation of contraction of the left ventricle causing an increase in pressure, that the pressure falls to a low level in the ventricle when it relaxes and that the closure of the semi-lunar valves at the base of the aorta prevents blood pressure falling to as low a level as the left ventricle. Even fewer were able to correctly use the terms systole and diastole. Many made the error of describing the aorta as pumping blood to maintain high pressure rather than describing the role of elastic fibres and elastic recoil. This was despite a question covering the same content appearing in the May 2011 paper and detailed comments being made by the Principal Examiner on this same point.

Disappointingly, many candidates could not identify Region III as being the arterioles and most gave reasons for the fall in blood pressure because the blood had reached the capillaries or veins or even that there was no blood left in the heart!

Candidates who had learned the process of tissue fluid formation gained good marks on this part of the question. Most, however, did not refer to differences in hydrostatic and osmotic pressures in their answers. Many described blood as passing out of the capillaries rather than plasma and very few showed an understanding of the role of the lymphatic system in draining excess tissue fluid.

Q.5 This question was answered reasonably well in general.

The question on reproductive strategies of vertebrates highlighted a lack of knowledge of internal fertilisation and the development of the amnion in reptiles, birds and mammals. Furthermore, some candidates did not understand the role of the yolk as a source of nutrition for the developing chick and the consequence of low yolk content on its development and the need for greater care post-hatching. Similarly, an understanding of the reproductive strategy of investing high amounts of time and energy to raise a small number of offspring to increase chance of survival was not clearly communicated.

Again, despite comments being made about the spelling of metamorphosis on last Summer's BY2 paper this still remains an issue; the spelling of the term was highly variable and, as stated in the examiner's report, although phonetic spelling is allowed, entire syllables cannot be left out.

Most answers to the question on ecdysis demonstrated a lack of understanding of the constraints on growth caused by the exoskeleton. Most referred only to regular moulting and did not explain the sudden increase in length before the exoskeleton hardens.

The spelling of tracheae and spiracles was generally poor with much confusion between similar words such as trachea, tracheids. Sphericals was a common alternative to spiracles. Again, although phonetic spelling is accepted some terms do need to be learned and spelled correctly to avoid confusion.

Q.6 Essay (a) on the uptake of water by plants was usually well answered with many candidates gaining high marks. Marks were lost mainly due to a lack of detail in explaining the role of ions in the process and, in some cases, the continued use of differences in water concentration rather than water potential to explain the movement of water.

Most candidates answered essay (b); the general standard of their responses, however, was poor and demonstrated a lack of understanding of several basic biological principles.

A large number of candidates could not explain the link between increased volume and increased metabolism or the link between surface area and absorption of gases.

Many candidates described a list of adaptations of terrestrial mammals to gaseous exchange in air as large surface area, moist, rich blood supply, internal etc., without explaining how or why these adaptations are important. A significant number also described gaseous exchange in fish, insects, birds, reptiles and amphibia and gained no marks for their efforts.

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

Principal Examiner: Mr. P. Owen

Unit Statistics

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Unit	Entry	Max Mark	Mean Mark
HB2	308	70	35.6

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.

Human Biology HB2

Many candidates found some parts of the paper very challenging. Particular issues centred on the use of appropriate scientific terminology and the inability of candidates to write a coherent sentence. All too often, candidates answered questions by making vague generalisations. This was particularly true in answers to some of the parts of question 3 where references to 'fighting disease' gave the impression that the body was involved in a pugilistic contest rather than a biochemical response.

Q.1 Candidates did not find this question easy despite it being intended as an easy opening question attempting to settle in candidates to the paper. Although some scored maximum marks, many did not. The two descriptions known by the majority of candidates were those for plants and animals with Prokaryotes and Protoctista causing the greatest problems.

Q.2 In part (a) few candidates scored maximum marks. A common mistake was to state that 'blood passes through the heart twice' without adding, during one complete circuit. Worse still, were those candidates who stated that it passed through the heart twice during one heartbeat. Some candidates made reference to separate pulmonary and systemic circulations though it was often described as 'to the body, and 'to the lungs'. Few candidates made reference to the speed of blood flow its pressure or the separation of oxygenated and deoxygenated blood.

The answers to part (b)(i) uncovered a dreadful lack of knowledge of the position of these two nodes.

The role of the AVN and the septum were known to a point but, a common failing was to not use the term 'wave of excitation', nor to make reference to the fact that the wave from the SAN passed to the AVN. Some candidates failed to make reference to the point that the arrangement ensured that the ventricles contract from their base/apex (too often the term 'bottom' was used).

The calculations in answer to part (c) ranged from the correct number to many millions. It is difficult to conceive that a candidate who leaves an answer to a question asking for the number of beats of a human heart in the course of one minute being several million, would see this as a realistic answer.

The answers to part (d) were characteristically lacking in fine detail. For example, a common phrase would be that 'cholesterol/atheroma builds up in an artery and causes a blockage so blood/oxygen can't flow to the heart. At this level there needs to be a reference to the formation of an atheroma/deposition of cholesterol on/in the internal wall of the coronary artery which narrows the lumen, raising the potential for a blood clot which prevents the passage of oxygen to a part of the heart muscle.

Q.3 (a) (i) is asking for trends, not specifics and few candidates could distinguish between a gentle/small initial increase in cases, followed by a large increase and that the number of cases in drug users was greater overall. Most candidates just made a general reference to there being an increase. Some candidates referred to the fall in 1991 but the question asks for the position up to 1990.

The answers to part (a) (ii) usually had some reference to increased awareness/education variously expressed but, a common mistake was to refer to contraception in general terms rather than a specific reference to the use of condoms. Few candidates made a coherent reference to the increased use of sterile needles or non-sharing of needles by drug addicts.

In answer to part (b) very few candidates made any reference to the presence of HIV antibodies in the blood though many recognised that it was in a dormant/latent phase and could take many years to fully develop. Many candidates seemed unaware that AIDS is caused by a virus or at least made no statement to that effect, though many appreciated that antibiotics are only active against bacteria.

In answer to part (d) the point that the organism (though some did say the disease) mutates regularly and therefore, it is difficult to produce an effective vaccine. Few could answer part (e) fully. Many were able to comment that T helper cells were destroyed/reduced in number but could not then go on to develop the argument further as to how this ultimately led to death from other infections.

- Q.4 The answers to both parts of section (a) were often poorly expressed. References to carbon dioxide being 'filtered' were common and few candidates made the simple assertion that the soda lime would absorb the gas. Some candidates wanted the whole of the spirometer sterilising rather than just the mouthpiece. Many candidates did not appear to understand the terms tidal volume and vital capacity and consequently, gave a variety of incorrect answers.

Part (b)(ii) caused problems for most candidates who did not appreciate that the air in the alveoli is stationary and therefore, exchange of oxygen and carbon dioxide had to take place between that stationary air and inhaled air. The role of surfactant was well understood as was the effects of a lack of surfactant in premature babies.

- Q.5 Despite the question in part (a) asking for structural differences, many chose to include functional differences. A question that asks for differences cannot be adequately answered with a simple statement about one of the comparators. A comment that 'an artery has a small lumen' should be followed with the converse that 'a vein has a large or larger lumen'. A large number of candidates could not identify the type of blood vessel in (b) (i) and very few made reference to ventricular systole and diastole in answer to part (ii) instead, reference to 'heart contracting' was quite common. Many candidates recognised that the fall in the maximum blood pressure was because the blood, though many stated 'vessel', was further from the heart but, very few made any reference to the role of friction in the process.

- Q.6 This question was very poorly answered by most candidates and it was unusual to see full marks. In part (i) the fact that the healthy child's antibodies peaked at a higher maximum, though not very often being expressed in quite that way, was the point made most frequently. Few candidates gave specific comparative figures to support their statements.

The answers to part (ii) were most disappointing in that very few candidates appeared to understand that antibodies require protein in the diet for manufacture because they are composed of proteins.

Q.7 The number of candidates answering the questions was equally split and gave many candidates the opportunity to improve upon what would have been otherwise, exceptionally poor marks. Control of the spread of malaria was well known by many candidates though a sizeable number insisted on writing down everything they knew about malaria which often meant the first page of writing was completely irrelevant. One point of weakness was that some candidates failed to explain how a particular method of control actually worked and far too many mentioned that spreading oil/diesel on the surface of water 'clogged up' the larvae without any reference to the breathing tubes being blocked and gaseous exchange being prevented. Many thought that malaria is caused by a bacterium and therefore antibiotics could be used.

The answers describing protein digestion were often not as well constructed in that they did not always follow the processes in a sequential manner and, often failed to specify exactly where the relevant enzymes were located. Few candidates made reference to the passage of the absorbed amino acids being via the hepatic portal vein to the liver and few made reference to both facilitated diffusion and active transport in the process of absorption.

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Principal Examiner: Dr. C. Blake

Unit Statistics

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Unit	Entry	Max Mark	Mean Mark
BY4	3689	80	55.4

Grade Ranges

A	65
B	58
C	52
D	46
E	40

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

Biology BY4

The quality of responses was good and many candidates had a very sound knowledge of areas of the syllabus which on previous papers had caused difficulties. Answers to some questions were very long with all aspects of the topic being written about rather than a concise answer to the question. Many candidates used the margins and blank areas on the paper and extra booklets, often without any indication that the answer was continued. The examiners are becoming increasingly concerned with the spelling of technical terms, many candidates are losing marks as a result of this.

- Q.1 (a) (i) Dendrite, axon, node of Ranvier (or spellings to that effect) were usually correctly labelled but the synaptic knob / motor end plate caused the most problem, nerve ending being the most popular error.
- (ii) We were surprised that many candidates did not know what an effector was, collecting ducts and hormones were commonly given.
- (iii) Many candidates do not appreciate the difference between grey and white matter or that the axon of a motor neurone is found in the ventral root.
- (b) (i) Very good responses but phospholipid was only given by the very best candidates. Many candidates gave insulation as a function of the myelin sheath but did not qualify it. Increasing speed of transmission and reference to saltatory conduction were common. We had incorrect reference to protection of nerves by several candidates.
- Q.2 (a) A pleasing number of candidates were able to gain high marks on the ATP question the only common error was stating adenosine instead of adenine. Most candidates stated that ATP was broken down into ADP and iP. Lots quoted 30.6 KJ, few stated hydrolysis and many assume that ATPase and ATP synthetase are the same. The site of oxidative phosphorylation was often given as the intermembrane space. Many candidates stated that the DNA would allow the mitochondrion to replicate, we did not accept 'makes protein' as we wanted the idea of coding. Many candidates thought that the DNA allowed the cell to replicate or coded for the proteins within the cell. There were some excellent concise responses linking high proton concentration to acidity but many candidates assumed that the change in pH was a result of carbon dioxide accumulation.
- Q.3 Answers describing the distribution of bacteria along the filamentous alga were muddled with many poor explanations. Weaker candidates often considered that the bacteria were photosynthesising and not the algae. There were many excellent accounts explaining the production of oxygen. Candidates correctly gave the names of suitable light absorbing pigments but correct spelling was a problem in many cases. There were sound responses to the question relating to the advantage to the plant of having pigments which absorb different wavelengths of light but many thought that it would allow the plant to photosynthesise at different times of the day and in one case even at night.
- Q.4 Most candidates realised why the sections were different but had enormous difficulty in expressing themselves and it was not uncommon to find a list of every structure in the nephron being given as structures present in the medulla. Most candidates gave excellent accounts of ultrafiltration but some did not appreciate the difference between ultrafiltration and selective reabsorption.

Q.5 The most common errors were to get Nitrosomonas and Nitrobacter the wrong way around, state Azobacter not Azotobacter and to get Rhizobium and Azotobacter confused. Many quoted Pseudomonas as an example of a nitrogen fixing bacterium.

Q.6 Very few candidates gave a correct explanation for the difference in population growth between glucose and lactose but the second part of the question caused few problems.

Q.7 (a) Respiration.

Responses were good but not many candidates actually stated that substances were enzymes or coenzymes. Many candidates think that NADH and NAD are the same and do not realise that NADH is reduced.

(b) Transmission of nerve impulse.

Good descriptions of the involvement of the membrane in the generation of a nerve impulse but again many essays on nerve impulses. Many candidates assume that the sodium potassium pumps are the same as the voltage gated channels. Many candidates failed to mention if it was the pre or post synaptic membrane which they were referring to, chloride ions were commonly confused with calcium ions and in numerous cases synaptic vesicles were released into the synaptic cleft.

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Principal Examiner: Dr. J. B. ford

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Unit	Entry	Max Mark	Mean Mark
HB4	197	80	50.6

Grade Ranges

A	61
B	55
C	50
D	45
E	40

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Human Biology HB4

There were some really excellent efforts on this paper and in general, adequately prepared candidates did not seem to experience major problems.

- Q.1 A few centres appeared to have ignored the nitrogen cycle altogether, but full marks were commonplace for this apparently easy opening question.
- Q.2 The average mark for this question was high and the biochemistry of nerve conduction had obviously been well covered by most candidates. A very small minority failed to appreciate that parts (a) and (b) were all about the resting potential and produced irrelevant accounts of the changes during the passage of a nerve impulse. More common were references to the diffusion of sodium out and potassium into the resting cell. Even where reference had been made to pumps, they did not seem to realise that the pumps were carrying out active transport. The great majority answered (c) and (d) correctly, although in the latter case, Parkinson's occasionally cropped up instead of MND.
- Q.3 Perhaps not surprisingly, there were more correct answers in the 'respiration' column than in the photosynthesis column. Part (e) caused the most problems and there were widespread confusion about the orientation of the membrane proton concentration in the two organelles. Answers such as 'from in to out' or even 'from left to right' appeared quite frequently. It was also surprising that (f) was generally poorly answered. Not uncommonly candidates simply gave as their only answer that ATP was synthesised by the electron transport chain in both cases. Since this was effectively the first line in the question, these answers were not accepted.
- Q.4 Part (a) (i) produced very few problems but, surprisingly in (ii), many found it difficult to clearly express the problems of counting excessively high concentrations of bacteria. The majority managed the calculation correctly, but there were some with arithmetical errors and a few multiplied by 4 rather than 10^4 . Part (b) also produced few problems but simply comparing 'birth rates' without any explanation was penalised.
- Q.5 Full marks for this question were not uncommon. The most frequent error occurred in part (c) when the calculation was based only on the 'ATP produced' and 'ATP used' columns in the preceding table, ignoring the ATP derived from reduced NAD.
- Q.6 Part (b) was non-recall element to test the ability to derive a theory about the data provided. These three or four marks were generally gained by the 'high fliers'. Quite a few of the attempts caught on to the idea that since sodium uptake was unaffected, a concentration gradient would be observed across the tubule. What only a few realised was that this gradient would withdraw water osmotically, increasing the glucose concentration. More usual was the strange suggestion that if sodium ions were withdrawn, the glucose molecules no longer 'had to share' the solution in the tubule and their concentration would therefore be higher.
- Q.7 Both of the essay topics were divided into a seven mark factual account and a three mark section in which candidates could express their knowledge and ideas about the topic. Candidates with good examination technique realised that if section (ii) had just under half the marks allotted to question (i), it deserved more than a one or two sentence answer.

In the case of 7(a), the answer to the second section was often just a brief repeat of the answer to the first part. Some mentioned the use of protective clothing and masks, but there were a host of other ideas on health and safety e.g. sterile rooms rather than sterile benches, restricted access, constant monitoring, health checks, much stricter cleaning and disposal of equipment and soiled materials, etc. These suggestions could be derived from common knowledge or just common sense but this was not always evident.

Similarly with 7(b), a high proportion of the answers on the Calvin cycle scored full marks. However, when it came to the more general significance of photosynthesis, many could not see the wood for the trees! There were three main generalisations. The first is the production of oxygen and the uptake of carbon dioxide. One or both of these did appear in most answers. The second is nutrition. An example of the way many answers dealt with this would be a single sentence such as 'plants make glucose which humans require for respiration'. The idea that all our nutritional needs must be derived directly from plants or indirectly via other animals rarely appeared. Very few mentioned the non-food materials derived from photosynthesis, such as timber and fossil fuels, which are of such great importance to human societies. The third generalisation concerns energy. Numerous scripts contain statements such as 'plants provide carbohydrates which humans use in respiration to make energy'. With very minor exceptions, virtually all biological energy is derived from the sun. Humans, like all other animals, are totally dependent on plants to transform light energy into chemical energy, which is transmitted down the food chains. Candidates at A level should not be talking about biochemical reactions manufacturing energy.



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