



GCE EXAMINERS' REPORTS

**BIOLOGY (NEW)
AS/Advanced**

JANUARY 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
January 2010
Advanced Subsidiary/Advanced

Principal Examiner: Mr P. Owen, B.Sc.

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	4811	70	40.5

Grade Ranges

A	51
B	46
C	41
D	36
E	32

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

Biology BY1

There were many well prepared candidates who demonstrated a secure knowledge and understanding of the material. However, there continues to be a problem with a significant number of candidates who fail to express themselves clearly and respond in a very superficial manner, often failing to use appropriate terminology. The mark allocation provided at the side of each question is a useful guide to the number of points that need to be made in any answer but, it appears that many candidates do not utilise the information effectively.

Q.1 This opening question proved problematic with respect to the statement 'Found in nucleus'. Many candidates, including overall high scoring candidates, did not appreciate that RNA will be found in the nucleus and so, it was unusual for the full six marks to be awarded.

Q.2 This question is a good example of where answers often lacked detail. Whilst the question is in the form of a table nevertheless, there is plenty of space for answers. The function of the inner membrane of the cristae is to provide a large surface area for enzyme attachment. Many candidates simply stated 'aerobic respiration'. Similarly, the structural feature of the Golgi body is a stack of flattened sacs or cisternae and not just a reference to sacs.

Q.3 Part (a)(i) was often answered in a vague manner such as 'embedded', rather than giving a detailed reference to an inert matrix or alginate beads.

Many candidates could give at least two advantages but often did not express themselves very clearly when describing the operation of the process over a wider range of temperatures or pH because of increased enzyme stability. Confused references to optimum conditions varying were common.

The role of the partially permeable membrane was poorly explained. Two points were required, namely, passage of urea molecules and the prevention of the passage of the larger solute molecules. Many candidates gave vague answers about small molecules passing through or referred to separation of the urea without giving precise details.

The role of the transducer was also poorly explained with few candidates relating the ammonium ions being attracted to the electrode and this being converted into an electrical signal which would give the concentration of urea.

There was an expectation that in answer to part (c) candidates would give an account of different temperatures giving rise to variable levels of enzyme activity. This in turn would affect the rate of production of ammonium ions which would then affect the reading. Instead, most candidates simply referred to it being a fair test.

Q.4 Candidates experienced difficulties in placing the position of cytokinesis and despite the question asking for the addition of a segment to indicate its position in the cycle; many candidates included it in the telophase segment.

Only a minority of candidates could list four events that occur during interphase and a common problem was poor use of terms. For example candidates should describe the process of DNA *replication* not duplication or doubling. Synthesis of proteins was not seen too often though cell growth was a common answer.

The events of mitosis were well known and full marks for section (c) were not uncommon.

Q.5 As is often the case questions on plant physiology are not appreciated by the majority of candidates and this proved to be no exception. Although most candidates correctly identified the direction of water flow, some drew arrows in the wrong direction and a few didn't include any of the three cells A, B and C. Explanation of the movement caused difficulties for many candidates and they seemed unable to give a general explanation of movement from high to low water potential. Many candidates failed to state that the movement was by osmosis. A sizeable number of candidates referred to water concentration in this and other parts of the question which scored no marks.

As was to be expected many candidates lost a mark by failing to put the units at the end of their calculation in part (b)(i). It is such an elementary error that it is surprising that it is one that is still made by so many candidates.

Many candidates seemed unable to recognise the state of (incipient) plasmolysis as shown in the diagram and were often unable to explain how this condition could have been brought about.

Candidates largely, were unable to explain how pressure potential is generated apart from an inflow of water. The expansion of the protoplast was often ignored and only a very few could explain the inelastic nature of the cell wall as having any significance.

It was most surprising that very few candidates understood that if all of the cells of a plant were in the same condition as cell Y, the plant would wilt.

Q.6 Part (a)(iv) of this question was poorly answered. Whilst many candidates recognised that alternate units were at 180° , few could give details about adjacent chains being linked by hydrogen bonds into microfibrils. Many candidates did not recognise that the highest level of protein structure was tertiary, many saying 'secondary' or giving the total number of amino acids as the answer. The importance of the S-S linkage was often described with vague references to shape rather than giving details of a 3D, globular or specific shape as required by the active site for the formation of enzyme substrate complexes.

By far the commonest error in answers to part (c)(i) were references to the 'amount' of hydrogen peroxide or the sample. A general reference to 'substrate' was a common but unacceptable answer.

The majority of candidates had little appreciation of the fact that the liver is a metabolically very active organ which would generate higher levels of peroxide. References to animals being active were relatively common.

Q.7 Part (a) was by far the more common of the two questions in this section. It was generally well answered though the quality of diagrams drawn was very variable. Diagrams were particularly helpful in showing the arrangement of the hydrophilic heads and hydrophobic tails as many candidates failed to state this in their written accounts. Points that were not often seen related to the membrane separating the contents from the outside and acting as a barrier controlling the entry of molecules into the cell. Many candidates had problems in linking the protein components to their assigned functions. Often there was simply a listing of the ways in which molecules could cross the membrane without any reference to the involvement of the various proteins.

Part (b) was not as well answered, largely because candidates were unable to comment in any detail on the function of lipids. Instead they focused on the structural elements and often scored a maximum on that aspect with little reference to function. Candidates should be encouraged to use the term *thermal* insulation rather than just insulation as it has other connotations and there was a mark available for a reference to the role of lipids in myelin sheaths. The role of lipids in buoyancy was rarely seen.

BIOLOGY
General Certificate of Education
January 2010
Advanced Subsidiary/Advanced

Principal Examiner: Dr J. Ford

Unit Statistics

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Unit	Entry	Max Mark	Mean Mark
BY2	867	70	31.0

Grade Ranges

A	46
B	41
C	36
D	31
E	27

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

Biology BY2

- Q.1** Completely correct answers were often given. The most common error was to confuse Protoctista and Prokaryotae when attempting to assign Amoeba and the bacterium to the correct kingdom.
- Q.2** Candidates who had covered the evolution section in the specification had no difficulty with (a) and (b)(i), but with (b)(ii) they were often less successful. Two points were involved here. 1. The initially empty niches on Galapagos in comparison with Britain now. 2. The idea that as the Galapagos population began to grow, the principal competition was intraspecific whereas in Britain it would be initially interspecific. Mention of the first point was infrequent and references to competition suffered from a lack of any comparison of the two situations, although credit was given when competition was mentioned. Many answers to (c) suffered from poor expression and surprisingly, many candidates appeared unaware of the classic distinction between species based on the failure to interbreed successfully. Equally surprising were the many answers to (d) which failed to make any mention of DNA comparisons.
- Q.3** This was generally quite well answered. Some candidates had problems with (b) because they had no idea of the meaning of the word 'dentition'. There were also frequent references to a horny pad instead of some of the teeth in the rabbit; an apparent confusion with sheep. The weaker answers to (c) indicated the role of bacteria in cellulose digestion but omitted to mention the lack of a cellulase in most animals.
- Q.4** The ability to draw a meaningful diagram of parallel flow seemed to be centre-based. Where a sensible diagram was provided it was often let down by a failure to label and give directional arrows on the lines drawn. Other common errors were to start the blood plot at zero oxygen tension, or failure to show convergence at the 50% level.
- Q.5** This was the weakest question in the majority of cases. The transport of respiratory gases is an important topic in the specification and yet, in the case of carbon dioxide transport, candidates' understanding was extremely patchy. Parts (a) and (b)(i) were not answered well. More surprisingly the role played by hydrogen ions in the release of oxygen from oxyhaemoglobin [(c)(ii)] was rarely mentioned. A range of all sorts of ions was offered at (c)(iii) and even those answers that gave chloride (not chlorine) ions, often could not correctly explain the chloride shift.
- Q.6** The graph plotting was well done with the majority of candidates scoring full marks. Part (b) was not answered well. Although leaf function is an important topic in this module far too many answers didn't describe the difference required in the question, and gave explanations based simply on a rise in temperature and evaporation at 16.00 hours. Any mention of light intensity, photosynthesis and their relationship to stomatal opening were given in only a small minority of answers.

Q.7 The essay questions were generally quite well answered and full marks were scored on both of these topics, the most popular being the regulation of heart beat. In several answers a great deal of time and effort was wasted by the inclusion of a detailed and irrelevant account of the circulatory system in general. Similarly, on the second topic, a failure to read the question thoroughly resulted in extensive discussions on the adaptations to reproduction on land in amphibians, birds and reptiles in addition to mammals, often with a minimal mention of fish.

In general the overall results for this paper were disappointing. There were some very good scripts, but these were relatively few and far between. Too many candidates had apparently failed to prepare themselves adequately and were failing to score marks on straight-forward topics, which are central to the biological principles covered by this module.

BIOLOGY
General Certificate of Education
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Advanced Subsidiary/Advanced

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

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Unit	Entry	Max Mark	Mean Mark
HB2	209	70	43.4

Grade Ranges

A	53
B	48
C	43
D	38
E	34

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

Human Biology HB2

All the questions were accessible and well-prepared candidates scored highly. Some candidates lost marks due to a combination of weak powers of expression and not reading the questions carefully.

Q.1 An easy opening question, which was well answered by the majority of candidates.

Q.2 Well answered. In (b)(ii) it should be noted that the binomial name of the human is *Homo sapiens* and not *Homo sapien*. In (c) many candidates seemed unfamiliar with the term 'speciation' and consequently were unable to give the correct response to 'the appearance of a new species'.

Q.3 A well answered question by the majority of candidates.

In (a)(ii) a common incorrect answer was that 'the surfactant prevents alveoli sticking together' rather than 'preventing the lining of individual alveoli sticking together'. The clue is in the stem of the question with the mention of 'inner lining'.

In part (b) it was pleasing that most candidates were able to interpret the graphs correctly.

Q.4 Generally well answered.

Q.5 In (a)(i) a common response to the function of the coronary artery was that it 'supplied the heart with oxygen' with no reference to the heart muscle.

In (a)(ii) vague statements relating to risk factors, such as an unhealthy diet or a diet high in fat, were not acceptable. At AS there must be a reference to saturated fats, high salt levels, and high cholesterol in the diet.

In (a)(iii) a common answer (which gained only one mark) was that an atheroma is formed when a fat deposit builds up in the wall. Candidates failed to gain full marks as they did not appreciate that the fat is taken up from cholesterol in the blood.

In (b) responses were centre based and some candidates were obviously unfamiliar with the term 'angioplasty'. In general answers lacked detail.

Q.6 This question on skin wounds required the candidate to know how healthy skin prevents the entry of pathogens and what responses reduce invasion if the skin is damaged. There were many vague answers, such as that the useful bacteria on the skin kill harmful bacteria and that acid kills pathogens, rather than appreciating that the natural skin flora and skin pH prevents the growth of pathogens.

In (b) responses such as 'white blood cells' or 'platelets' was insufficient to gain marks as these terms are labels in the diagram. Candidates must give more detail in their answers to show that blood clotting results in the sealing of wounds and that white blood cells engulf bacteria by phagocytosis. At AS level it is not acceptable to state that 'white blood cells kill bacteria'.

Q.7 A poorly answered question on the parasite *Schistosoma*. Many candidates confused this with the other parasites on the specification, particularly the pork tapeworm. In (a)(iii) and (iv) candidates were poorly prepared and lacked knowledge of how the parasite is transmitted from the human to the snail. Few mentioned larvae boring into the snail and also how the parasite is transmitted from the snail to humans.

Little heed has been taken of past examiners' reports stressing the need for good detailed definitions. Very few gained a mark for the definition of 'endemic' in (a)(i).

Q.8 Candidates answering the question on cell mediated immune response and AIDS tended to gain high marks. Weaker candidates chose to answer the question on vaccination and many produced some very confused responses.

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Unit	Entry	Max Mark	Mean Mark
BY4	2596	80	50.7

Grade Ranges

A	61
B	55
C	49
D	44
E	39

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

Biology BY4

Candidates had been well prepared and there were very few 'nil responses' to questions or subsections. There was a pleasing range of marks and virtually all of the points on the mark scheme were seen. Spelling, especially of technical terms continues to be a problem. Simple mathematics causes significant difficulties to many making them lose marks by carelessness in their responses and failing to develop a point. Candidates cannot assume that the examiner will do the extra work for them, quite simply if it is not written in the text no mark can be awarded. Many candidates use diagrams in their response which is perfectly acceptable, but these are of little use unless annotated, and it is pointless drawing a diagram, annotating it and then repeating the information in essay form.

- Q.1**
- (a) Most candidates were able to classify the bacteria although the spelling of *Spirillum* did cause problems and in some cases so far from the correct spelling as to be not acceptable.
 - (b) Very good responses to the colour of bacteria after Gram staining were given.
 - (c) Candidates did appreciate that facultative anaerobes can survive in both aerobic and anaerobic conditions but only the stronger candidates seemed to appreciate that obligate anaerobes cannot survive in the presence of oxygen.
 - (d)
 - (i) Almost all candidates could give four methods to prevent contamination of plates when being inoculated. Some marks were lost by carelessness, inaccurate statements such as 'flame the culture tube', 'heat the culture tube using a bunsen' and burn the plastic spreader before using it. Candidates also found difficulty in explaining how the Petri dish lid is held at an angle during inoculation, there were many improbable and unrealistic interpretations.
 - (ii) Many candidates did appreciate that sealing the Petri dish could lead to anaerobic conditions and that many anaerobic bacteria are pathogens. But far too many thought that if bacteria were incubated at 37°C they would be denatured.
 - (e)
 - (i) Merged colonies often given as the reason why plate A not used but very few stated why plate C would not be used.
 - (ii) Answers ranged from 2 to 2 million. Very few seemed to be able to get the correct answer.
- Q.2**
- (a) Usually good responses but some inorganic phosphate for P some adenosine for Q and some ribulose for R.
 - (b)
 - (i) Many candidates forgot to state that ATP supplies or releases energy and many stated that ATP produced energy which was not acceptable. The examiners did not accept statements such as supplies energy for *most* reactions or most cells or many organisms.
 - (ii) Candidates produced some good responses although there were a number of candidates who considered that the tapeworm got its oxygen from the host or absorbed ATP from the blood of the host.

- Q.3**
- (a) Usually very accurate responses although D featured in lots of answers.
 - (b) Excellent knowledge shown by almost all candidates. There were some recurrent errors such as NAD for NADP and hydrolysis for photolysis but in the main very good.
 - (c) Good but many just wrote all they could about the Calvin cycle and failed to say that it would not take place in plants treated with Atrazine.
- Q.4** New to the syllabus and not answered particularly well.
- (a) Very few candidates could give three functions of a synapse and indeed it was not uncommon for a candidate to not actually know what a synapse is. The concept of polarity, temporal and spatial summation is not generally understood, although being taught well in some centres.
 - (b) Comparison between neurones in a vertebrate and neurones in a nerve net again caused problems, it is hoped that the detail in the published mark scheme will help.
 - (c)
 - (i) Many made an inaccurate statement that the speed of conduction was always faster in myelinated neurones than in unmyelinated, which from the graph is not correct. Two out of the possible three marks was the norm for this question.
 - (ii) Some of the very able candidates could state why myelinated fibres were never less than 1.0µm in diameter, but the common response was that it was caused by the size of the myelin sheath.
 - (iii) This was a 'suggest' question and most candidates were able to state two ways in which organisms speed up the rate of conduction. Many did state increase body temperature for the third point.
- Q.5**
- (a)
 - (i) Many candidates still do not appreciate the position of the nephron in the kidney.
 - (ii) Very good responses, most candidates appreciated that increase in concentration of urea was a result of water being reabsorbed.
 - (iii) Good responses but many did not appreciate that both the Glomerulus and Bowman's capsule are involved in ultrafiltration.
 - (iv) Candidates are not good at using the term water potential, there were many correct responses but an equal number of erroneous guesses.
 - (b)
 - (i) Many long loops of Henle but quite a few short and quite a few large (which we did not accept). It was quite rare to get a second point.
 - (ii) Many candidates stated that water was produced from metabolism or gave a very full and detailed description and were awarded full marks. There was obvious confusion by some who thought that water was produced during hydrolysis or during digestion. Candidates should realise that the more hydrogen that there is in a respiratory substrate the more water that will be produced.

- Q.6** (a) Essays describing and explaining the shape of the population growth curve were excellent except many candidates assumed that *Penicillium notatum* is a bacterium and there was constant reference to the 'birthrate' in bacteria or reference to bacteria giving birth.
- (b) The candidates attempting the essay on the involvement of bacteria in the maintenance of soil fertility expressed themselves well and showed an excellent knowledge. Marks tended to be lost in the second section and many candidates did not fully appreciate how farming practices could encourage the activity of the bacteria.

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Unit	Entry	Max Mark	Mean Mark
HB4	111	80	44.4

Grade Ranges

A	57
B	51
C	45
D	40
E	35

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Human Biology HB4

All questions were accessible and the well-prepared candidates were able to score highly. It is, perhaps, disappointing that the 'applied' topics on the specification, such as fast and slow twitch muscle fibres, diseases of the nervous system, and the effect of organophosphorous insecticides on the transmission of the nerve impulse, were poorly answered.

- Q.1** A well answered question with many candidates gaining full marks.
- Q.2** There were many weak answers to the question on fermenters, with the function of the parts of the fermenter poorly answered by the majority of candidates. A common error in (a)(i) was that the cooling jacket 'provides a constant temperature' rather than 'the removal of heat generated by the respiration of microbes'. In (a)(ii) a common error was that the air filter 'sterilises the air' rather than 'the prevention of contamination by unwanted microbes'. In (b) only the better candidates understood the meaning of a batch fermenter and few could explain the principle behind its use in the production of penicillin.
- Q.3** It is pleasing that the majority of candidates scored highly on this respiration question.
- Q.4** The photosynthesis component in the Human Biology specification has a reduced content compared with that of the Biology and it was pleasing that in (a) many candidates had a good understanding of how energy is made available to generate ATP. However, in (b) it was surprising how many candidates failed to realise that the question referred to the Calvin cycle. Responses in part (d) were also weak with candidates not appreciating that the specification refers to how glucose, lipids and amino acids may be manufactured from triose phosphate and built up into a variety of plant products which provide food for humans, e.g. lipids in food stores in seeds.
- Q.5** Many candidates performed poorly on this kidney question. Although they had a good understanding of the labelling of the parts of the nephron, in (b)(i) few could list four correct differences between the blood entering and leaving the kidney. In (b)(ii) some candidates knew that it was urine that leaves the kidney but very few could describe its composition. Answers to (c) were weak. In (d) a knowledge of the ethical issues involved in the use of kidney transplants was extremely poor with candidates unable to express themselves clearly and produced vague statements.
- Q.6** The topic of muscle contraction was well understood and most candidates gained high marks on parts (a), (b) and (c). However, part (d) produced some poor answers with candidates having little knowledge of changes that may occur in slow twitch fibres during a programme of aerobic training.
- Q.7** This question was generally well answered although in (b)(ii) a description of how an action potential is generated posed problems for the less well prepared candidates. In (c) a knowledge of the diseases of the nervous system was sadly lacking in the majority of candidates.

Q.8 Answers to the growth curve option (a) were very disappointing. In (i) most could state the terms for the stages of growth but few could explain concisely what was happening at each stage and there was a tendency to describe changes in growth rather than changes in number. In (ii) a comparison with human growth curves was weak and showed a general lack of preparation for this essay.

Candidates who chose the synapse essay option (b) often gained high marks in (i). However, an understanding of how organophosphorous insecticides affect the transmission of a nerve impulse was sadly lacking in the majority of candidates.



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