

# **Human Biology**

Advanced GCE A2 7886

Advanced Subsidiary GCE AS 3886

## **Report on the Units**

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**January 2009**

**3886/7886/MS/R/09J**

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This report on the Examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the syllabus content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the Examination.

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**Advanced Subsidiary GCE Human Biology (3886)**

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# Chief Examiner's Comments

## Chief Examiner's Comments

This series marked the examining handover, with the first AS unit (F221) of the successor qualification being available alongside these legacy papers. This meant the vast majority of candidates sitting papers 2856, 2857 and 2858/01 were students resitting these units from the previous year.

Throughout the lifetime of this specification the tactical resitting of units to maximise UMS points has been common practice. With the introduction of the A\* grade at A2 however, this strategy may no longer be advantageous for the most able candidates with the new specification. As has been previously reported, resit candidates do not always show improvement. Centres are advised that resit candidates do need specific support especially with units that have pre-release material (in this series 2858/01).

As the end of the lifetime of this specification approaches it is worth noting that the summer 2009 series will have the last AS papers. In 2010 there will be A2 papers available for resit candidates. With this in mind, any candidates who will potentially be finishing their A Levels in 2010 should ensure they make any entries for AS resits this summer.

The contextual nature of this specification is well understood by Centres and the underpinning biology continues to be examined in context. Centres are advised that the new Human Biology GCE specification continues this theme and candidates should be prepared to deal with contextual information.

The A2 units in this specification contain synoptic elements. This series saw a significant candidature sit 2866, and the Examiners of this unit reported that candidates performed very well. The responses of particularly the better candidates was noticed by Examiners as being of higher quality than previously. Centres are reminded that although there is a significant amount of new material for 2866, candidates do benefit from specific training in synoptic skills. The synoptic questions of 2866 were not uniformly well answered this session.

The Examiners reported that the extended writing questions in 2866 this series showed a great deal of positive achievement and that many candidates were able to produce very coherent and well structured paragraphs even under examination conditions. This finding was tempered by some of the responses to the extended writing questions in 2856, 2857 and 2858/01 where weaker candidates tended to give a lengthy but low level response.

### Teaching tip

With permission, photocopy some long answer responses that are lengthy but of low quality. Set other students the task of marking these responses using OCR mark schemes. The experience of this will enable students to realise how few marks can be awarded to vague responses. Also set candidates the challenge of redrafting these responses to make them more concise, specific, informative and worthy of more marks.

## Understanding and answering the questions

The Examiners on all the units this series reported that candidates had attempted all the questions on the papers, indicating that in the main, candidates were able to comprehend and respond to the questions set.

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Some questions demand a specific response or more than one type of response from candidates, such as questions that ask candidates to describe **and** explain. These questions with more exacting stems were not as well answered as questions that allowed candidates greater latitude in their responses. Candidates need to develop the ability to use prompt material judiciously and to respond to the exact questions posed in order to succeed.

### **Teaching tip**

Encourage students to identify the command words in question stems using highlighters or underlining. Students can then be encouraged to brainstorm what material would be in a good answer and also to decide what information would not be appropriate.

There were many instances where candidates did not read the questions properly or did not pay close attention to prompt material. Candidates in some instances showed evidence that they had failed to read prompt material even when it was essential for the proper understanding of a particular question.

The highest omit rate for the AS papers this session was a straightforward recall question asking for an instrument that can be used to measure blood pressure.

There was evidence that some candidates were not producing answers that matched the marks tariff on the questions. Candidates should be trained to think in terms of one piece of AS or A level information for each mark available for a question.

### **Information, Figures, Tables and Graphs**

In general the data questions this session were handled well by candidates. Candidates were able to describe patterns of data shown in graphs well.

### **Teaching tip**

Students can benefit from writing descriptions of trends in data and explanations for those trends in different coloured pens. This can aid their ability to focus on what is being demanded by different examination questions.

## Mathematical requirements

This series saw good answering of the mathematical questions. Centres are reminded that the scope for setting calculations is broad in context but limited in the actual maths required, therefore it is well worth ensuring candidates have practiced examples of the most common types of mathematical question. Unfortunately in 2856 many candidates calculated the answer correctly but failed to round correctly and therefore lost one mark.

### Teaching tip

The final expression of answers is important in many examination questions. A simple worksheet consisting purely of calculations would benefit many candidates.

## Presentation

The language of written responses at times led to candidates failing to score marks. Examiners continue to see “creating” and “producing” energy as roles of the mitochondria. It would be worth reminding candidates of the old adage that energy cannot be created or destroyed, and that they should be answering in terms of ATP production.

Water “concentration” is another term that is still seen in the responses of some candidates.

Examiners can only give credit for what is presented to them, and it is therefore important that candidates can communicate their ideas in appropriate language and in an appropriate level of detail. Examiners reported that from all the examined units, candidates continue to lose marks from responses that are too vague to be awarded marks at GCE AS and A level.

## INSET

OCR is offering a programme of training events related to the new GCE Human Biology A-Level specification. Further details are available from the OCR website at [http://www.ocr.org.uk/Data/publications/training/Science\\_Training\\_Programme.pdf](http://www.ocr.org.uk/Data/publications/training/Science_Training_Programme.pdf)

### Forthcoming INSET events for new GCE Human Biology

#### Get Started – towards successful delivery of the new specification

These **new full day** courses give guidance and support to those delivering the new GCE Human Biology (H023/H423) specifications.

#### Course dates and codes:

A2 courses: Wednesday 1<sup>st</sup> April 2009 (London, OSCD101)  
Friday 3<sup>rd</sup> April 2009 (Birmingham, OSCD102)

Fee: £160 standard course rate (including refreshments, lunch and course materials), or £190 if you book within 7 days of the course date.

Places may be booked on these courses using the booking form available on-line at [http://www.ocr.org.uk/training/alevel\\_inset\\_training.html](http://www.ocr.org.uk/training/alevel_inset_training.html). Please quote the course code in any correspondence.

## 2856 Blood, Circulation and Gaseous Exchange

As this paper was available at the same time as the successor qualification the cohort of candidates was unique. This produced a different ability spectrum to previous series with fewer of the weakest candidates included in the entry.

The Examiners were pleased to see the standard of responses to this paper was generally high with all the questions and subquestions attempted by the majority of candidates.

The calculation on this paper was attempted by most candidates, though a disappointing number of candidates were unable to correctly round 6.666 to give 6.67. The extended writing question was set on the topic of smoking and the respiratory system. Many candidates excelled on this question and produced excellent responses. Unfortunately a minority of candidates responses were of KS4 (and even KS3) detail and these earned little credit.

- Q.1(a) This recall question was designed to be accessible to all candidates. Over 60% of candidates were able to earn all the available marks. Those that did not earn full marks tended to lose marks by not actually giving detail of the removal of blood from a vein. Instead these candidates used all the available space giving detail of the gloves and swabs used and not actually removing a sample of blood.
- Q.1(b) Pleasingly, the adherence to the rubric of this cohort was good. Centres may note that this predominantly year 13 cohort made few rubric errors. Centres could emphasise the following of rubric to year 12 candidates more forcefully.
- Q.1(c)(i) A well answered question.
- Q.1(c)(ii) This question discriminated well, with 40% of candidates scoring 4 marks and equal proportions on all other eventualities. Throughout the lifetime of this specification water concentration has not been credited unless qualified with a rider such as 'free' or 'effective'. Centres are advised to explain osmosis in terms of water potential to their students.
- Q.1(d) This question proved to be more difficult to candidates than anticipated. It was apparent that candidates were able to give three features of capillaries but were unable to address the question that specifically asked for structural features.
- Q.2(a)(i) As expected, candidates found the squamous epithelial cell hardest to identify and weaker candidates tended to confuse the leukocytes.
- Q.2(a)(ii) The features of these cells were well recognised. Examiners credited all valid responses (such as lamella, thylakoid or granum) in place of the response 'chloroplast', which is all the AS specification demands.
- Q.2(b) The structure and role of erythrocytes is clearly well understood by candidates, with many not only scoring both available marks but producing well worded comprehensive responses.
- Q.2(c) This calculation was well attempted - it was lamentable however that the answer 6.66 recurring could not be correctly rounded by a significant proportion of candidates.

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- Q.3 Despite the gap fill nature of this question it discriminated well and only the most able candidates scored 8 marks. The most popular wrong response to the number of oxygen molecules carried by a molecule of haemoglobin was eight. This is consistent with a number of texts using the phrase HbO<sub>8</sub>. This question therefore highlighted common misunderstandings between atoms and molecules. Practice of this question would aid future candidates in this area.
- Q.4 The performance of candidates on this question reflects their performance on the whole paper well. Some candidates had learnt this material well and gave fluent responses detailing the accumulation of neutrophils and the breakdown of alveolar walls in some depth. Slightly over 30% of candidates scored the maximum nine marks here. Some candidates were determined to fill all the response lines and gave answers that strayed into details of CHD that could not receive credit. The most common weakness highlighted by this question was a lack of AS detail in responses. Several answers did little more than state that smoking is bad for you and it harms your health. It is worth noting that low level responses such as these do not gain marks at AS level.
- Q.5(a)(i) Identification of the saturated triglyceride proved straightforward, but only the best candidates managed to identify that S represented a glycolipid.
- Q.5(a)(ii) This question had two marks allocated to it so responses limited to 'it has a double bond' were unable to score both marks. The additional detail was provided by just over 30% of the candidates.
- Q.5(b) This topic had never been examined before and with this in mind the Examiners were able to report many excellent responses. Many candidates have a comprehensive understanding of the roles of LDLs and HDLs. One of the features of this specification is the detail here, so it was pleasing to see centres had prepared candidates well in this area.
- Q.6(a) Intended as an accessible recall question. 75% of candidates gave the correct response.
- Q.6(b) This question was based around enzyme specificity but required linking to the unfamiliar material in the question stem. It was this extra step that proved too much for many candidates, with few able to link the whole of their argument to data provided in the question stem.
- Q.6(c)(i) Candidates showed consistent performance here. Most were able to describe the graph well quoting correctly from the data.
- Q.6(c)(ii) There were many candidates who struggled to put into words their ideas here - the phrase 'turnover number' was clearly unfamiliar to many and appreciation of it may have aided them to produce clearer responses.
- Q.6(d) This demanding final question required candidates to link together ideas in order to come up with a suitable response. As is often the case, the number of steps required to reach the answer does limit the number of candidates that are able to provide a suitable answer. This question proved a step too far for the majority of candidates. Yet some of the best candidates saw why it was important and scored the two marks with a few well chosen words.

## 2857 Growth, Development and Disease

The paper addressed several topics that candidates traditionally find difficult (growth curves, mutation), so it was pleasing to see that all candidates had attempted every question – there were very few omissions. Many candidates were clearly familiar with the topic being tested but failed to gain marks through careless use of terms and/or misreading of questions. There were several questions on the paper that required the reading of data from graphs, and the Examiners were disappointed at poor data quotes. This point will be made again in the context of individual questions.

- Q.1(a) Some candidates used language that could have been more precise, in relation to cell division, referring to rapid growth and division rather than continuous division. A few good candidates mentioned the spread of cells to other parts of the body. Some candidates, but not the majority, referred to the undifferentiated nature of cancer cells. Many candidates referred to processes, such as the transition of proto-oncogenes to oncogenes, rather than differences in cells.
- Q.1(b)(i) Good candidates described a process of radiation passing through the lung with more absorption in dense tumour tissue producing white/shadowing on the image. Some answers incorrectly described the reflection of radiation rather than its transmission. References to CT scans attracted marks if the same process of x-ray transmission was described correctly.
- Q.1(b)(ii) Generally answered well, with two good alternatives: surgery, chemotherapy and radiotherapy and, less frequently, immunotherapy were accepted. Lumpectomy was not credited.
- Q.1(c) Epidemiological evidence was required and most candidates referred to more lung cancers with more people smoking and/or higher incidence of lung cancer with more smoking. Alternative answers referred to the fall in risk with cessation in smoking and the increase in risk with passive smoking.
- Q.2(a)(i) Intended to be accessible to most candidates and this proved to be the case.
- Q.2(a)(ii) Again, intended to be accessible to most candidates and this proved to be the case.
- Q.2(b) The majority of candidates described the unzipping of DNA with some referring to hydrogen bonds breaking. As in previous sessions, there was confusion between protein synthesis and DNA replication, with weaker candidates describing RNA bases joining the DNA strand.

### Teaching tip

There is need to clearly separate the process of DNA replication and the process of DNA as the template for RNA and protein synthesis. In the new Human Biology specification, protein synthesis becomes an A2 topic.

Excellent answers provided a sequential account of DNA replication. Good answers also grasped the semi-conservative nature of replication with one new and one old strand in each molecule. Many candidates referred to the production of identical DNA in the context of the genetic code remaining constant and so addressed the second part of the question.

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- Q.3(a) The most common error was to ignore the reference to the first twelve months and to focus across the 84 months of the chart, reducing the likelihood of commenting on the 12 months in detail. Better candidates gave two distinct descriptions, one of the first three months and then 3-12 months. Candidates were required to give two time references (X axis values) and two concentrations (Y axis values) in order to describe a change and figures needed to be accurately read from the graph. Few went on to explain the changes in terms of clonal selection and subsequent high rate of antibody production by plasma cells and less than 5% of candidates scored full marks on this question.
- Q.3(b)(i) The Examiners were very pleased to note that the calculation was completed correctly by the majority of candidates (over 70% of the entry).
- Q.3(b)(ii) Candidates could make two valid types of comparisons: the proportion of men and women in one geographical region, or, a comparison between regions. Weaker answers did not address the proportions and quoted direct numbers. Some made statements quoting the percentage values correctly but without a comparative statement (higher, smaller, proportion).
- Q.3(b)(iii) Many candidates mentioned sexuality as a reason for the differences, but the reference was not specific enough to explain the data (e.g. more homosexuals in USA, more promiscuity in sub-Saharan Africa). The high relative proportion of women with HIV/AIDS was often attributed to a lack of contraception but again specific detail was needed – barrier contraception. The most common correct answer outlined transmission of HIV from mothers to children.
- Q.3(c) Many candidates reported the lack of testing, lack of testing facilities and unwillingness to be tested or to communicate results. Incorrect diagnosis answers referred to the short period before tests show positive results. Some correctly referred to inaccurate reporting, but occasionally references were too vague (e.g. 'South Africa is a big country').
- Q.4(a)(i) This proved to be a difficult question with only 25% of candidates being able to give a satisfactory explanation. The most common error was to refer to the Human Genome Project not the human genome itself. Answers referring to the genome as all the genes in the human body were accepted but less certain reference to 'genes in the body' were not accepted because they lacked a reference to all genes. Some referred to the genome as 'knowing the DNA sequence', but this was ambiguous and could easily refer to triplet coding for amino acids in a generic way, so was not accepted.
- Q.4(a)(ii) Less than 10% of candidates could expand upon their answer to part (i), which was disappointing. Internet sources such as the Human Genome research institute pages at <http://www.genome.gov/Education> provide a valuable background research resource to candidates.
- Q.4(b) This question was more accessible to weaker candidates and many wrote at length. Social implications offered by candidates included discrimination by employers, insurance companies and more generally, which individuals may suffer with low self esteem/depression etc. Weaker candidates also noted the option 'not to have children', which genetic screening could offer.

- Q.5(a)(i) Growth rate questions have proved challenging to students on previous papers, and this question was no exception. Good candidates gave a precise account of relative growth rate, referring to a difference in measurements between a start and end time interval and dividing this change by the start measurement. Height was the most commonly quoted variable. Some incorrectly referred to changes in growth rate rather than measurements, while some mentioned non-specific regular measurements. Again, careless reading of the question led to some candidates describing methods for biparietal diameter and crown rump length measurement, while other provided an account of the repeated measurement of birth weight of babies.
- Q.5(a)(ii) The Examiners were disappointed to see how few candidates could give a role for Vitamin D and a protein (just over 20%) References to bone often mentioned growth and formation, rather than strengthening. Good candidates referred to the link with calcium. Occasionally, candidates made correct reference to the incorporation of amino acids into new proteins, usually by naming a protein (e.g. haemoglobin). More commonly, proteins were simply connected to growth and answers given were often closer to a KS3 response.
- Q.5(b)(i) Candidates could generally describe the pattern of brain growth, however age ranges for high growth rate and subsequent slow growth were sometimes incorrect ( at the ages 6-8), as were references to percentage of adult size. It was important that candidates gave 'between ages' values.

**Teaching tip**

In making comparative statements OR in describing trends from graphs, make sure candidates refer to the axes for the units and give 2 x and 2 y values to illustrate a change.

- Q.5(b)(ii) Good answers referred to slow growth or even a two-phased growth until ages 13/14. Again it was important that candidates gave values at two ages to illustrate a pattern. Many incorrectly quoted the rapid growth extending to the age of twenty. Low scoring answers attempted to compare the growth rate of the brain and the reproductive organs without describing the pattern of growth of either. Good answers outlined differences between the brain and reproductive organs, but in so doing correctly outlined the pattern of growth of the reproductive organs.
- Q.6(a)(i) Most candidates (80%) made a reference to a change in DNA and/or base and/or a reference to a deletion/substitution/insertion, but only 20% of candidates could assemble these facts into a full answer.
- Q6(a)(ii) The most commonly provided correct answer was a reference to ionising radiation, many scored two marks by backing this up with an example of ionising radiation. A common error was to refer to heritability/inheriting diseases. References to age had to be qualified ('ageing'). Some mentioned increased mutation via older parenting of children.
- Q.6(b) Candidates confused changes to the haemoglobin molecule with changes to the shape of the red blood cell, and around 50% of candidates failed to score on this question. Good answers noted a change in the amino acid, often quoting valine to glutamate and the subsequent change of R group to hydrophobic from hydrophilic. However, many candidates then jumped to a change in shape of red blood cells and only a few referred to change in the polypeptide structure.

## 2858/01 Case Studies

### General Comments

Candidates entering the exam in the January session can only do so if a coursework mark is carried forward, hence they are invariably re-sitting. This may explain the number of candidates who described CPR rather than how to treat fibrillation. CPR has been asked previously and candidates were well versed in its use. This was a case of writing the answer to a question that was not being asked.

TB was well signposted in the case study and this is also where prokaryotic cells appear in the specification. It was disappointing how few candidates could accurately describe clear differences.

There are references given at the end of the case studies. Students should be encouraged to use these as part of their preparation. The questions have often 'grown' from ideas generated by these references, with Q.2 being a case in point.

### Teaching tip

Identify learning outcomes generated by the case studies for the candidates. Allocate the references out to individuals or small groups and ask them to summarise and/or find 'interesting' facts or ideas to share with the group.

Spelling was not penalised for terms such as sphygmomanometer, but there are a number of key pieces of equipment that are part of learning outcomes. It would pay to have these as a vocabulary list either visible in the classroom during teaching or in the students' notes.

There was no evidence that candidates had difficulty in finishing the paper due to shortage of time.

- Q.1(a)(i) Most candidate knew the term infectious disease.
- Q.1(a)(ii) The only other infectious disease on the specification as such is AIDS. Some candidates could not distinguish between the pathogen (HIV) and the disease it caused (AIDS). Other examples of diseases were given but in most cases candidates could not identify the pathogen.
- Q.1(b)(i) The Examiners were looking for a correct measurement (85 mm) divided by the magnification. It was not uncommon to see answers out by a factor of 10, but a disappointing number of candidates could not 'round up' correctly and several clearly did not have a calculator to hand.
- Q.1(b)(ii) Many candidates stated that eukaryotic cells did not have a cell wall, despite plant cells being on the specification. The most frequently seen correct answers referred to the absence of membrane-bound organelles and gave examples. Misconceptions abound regarding the cell surface membrane and the nuclear material, with candidates clearly confusing bacterial cells with viruses.
- Q.1(c) The method used by radiographers was generally well described although some candidates still refer to the use of radio waves. The symptoms of TB were well known, although coughing alone was not accepted and the Examiners required further qualification such as coughing up blood or sputum.

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- Q.1(d) The Examiners were pleased at the number of candidates who gave the name of an anti-TB drug, and examples of misuse (failure to finish the course) and mismanagement (failure to prescribe correctly) were generally well described. Weaker candidates tended to repeat several examples. The most frequent error on the part of candidates was to suggest that this led to mutation and resistance rather than there being a variation in resistance present in the population due to mutation. There were frequent references to 'stronger' bacteria and candidates found it difficult to distinguish between the pathogen (*Mycobacterium*) and the disease (TB), referring to TB surviving. Ideas about bacterial population growth are confused and the Examiners were surprised at the number of candidates who referred to bacteria dividing by mitosis. Some excellent responses were seen, with several candidates referring to the presence of resistance alleles or genes on plasmids and the possibility of horizontal transmission.
- Q.1(e) This question was a challenge for even the most able candidates. Incidence and prevalence have been tested on previous papers, but this particular question tested the candidate's understanding of the significance of relating the raw numbers to the population size. Candidates did gain credit if they recognised that incidence or prevalence rates are referenced to fixed numbers but few appreciated that a rise in the population that was faster than a rise in the number of cases would result in a fall in the overall rate of increase in TB.
- Q.1(f) The majority of candidates recognised that HIV results in a weakened immune system but relatively few could explain how this ultimately leads to TB becoming an 'opportunistic' infection. This term was used by several candidates and was credited although again poor spelling and/or misunderstanding was obvious, with 'optimistic' infections being referred to by more than one candidate.
- Q.2(a) Part (i) was answered well by most candidates once allowance was made for phonetic spelling, but the required answer of 'sphygmomanometer' in part (ii) was less frequently given and many candidates left this blank. Incorrect responses included haemocytometer and 'systolicometer'. Descriptions of the cuff were given and even drawings but these could not be credited as the name was required.
- Q.2(b)(i) This question was well answered, but yet again water potential is a difficult concept for human biologists with the most common mistake being to confuse which region had the higher or least negative water potential.
- Q.2(b)(ii) Many candidates lost marks by referring to water moving into cells but not specifying which cells. Again, many candidates failed to read the 'describe **and** explain' command words and gave extensive descriptions without giving an explanation of fresh water having a higher water potential than either salt water or the blood plasma. The Examiners were alarmed to see reference to cells becoming 'turgid' suggesting that the relevance of the cell wall in plant cells is not well understood by human biologists.
- Q.2(b)(iii) This was well answered on the whole, with most candidates referring to the correct location and some excellent descriptions of the role in terms of reduction of surface tension. Weaker candidates seemed to be suggesting that it prevented the lungs sticking together rather than the walls of the alveoli.

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- Q.2(c)(i) This question was generally well answered, although the term diffusion was missed by some candidates. Marks were lost for vague references to movement without indicating which direction the gases were moving in. Many candidates described how the alveoli were adapted for gas exchange rather than describing the actual process. Weaker candidates referred to oxygenated blood diffusing.
- Q.2(c)(ii) The Examiners were pleased by the number of responses that gave failure to regenerate ATP as part of the answer, although references to aerobic respiration were less common. The most frequent correct responses referred to a failure of oxygen to diffuse in and be transported to the muscles.
- Q.2(d) Candidates who selected emphysema or COPD as the disease were usually able to gain full marks by explaining the role of neutrophils in releasing elastase and destroying elastic fibres. References to loss of elasticity were not credited as this was given in the question. Where other diseases were chosen, a suitable reason for loss of elasticity was needed and this proved difficult. Candidates who chose asthma often referred to loss of elasticity of the airways, which would not have affected compliance. TB and lung cancer were credited as diseases but again, an explanation such as lack of elastic fibres or scar tissue was required.
- Q.2(e) This question was done well, with candidates who had described CPR often going on to suggest the use of a defibrillator. Weaker candidates referred to fibrillators but most were aware of the principle involved and referred to electrodes and electric shocks. Electrical impulses was a term that was used and weaker candidates did not make it clear if they were referring to the cardiac impulse or the electric 'shock' coming from the defibrillator.

## 2866 Energy, Control and Reproduction

Centres seem to be taking on board advice given in previous reports. This has been particularly evident to the Examiners in the past few sessions since there are far fewer vague responses. The level of detail given by candidates, especially in data interpretation, has definitely improved. This is highlighted in Q.3(d), where candidates were asked to interpret data from a graph and provide explanations for the trends.

It was pleasing to see that most candidates attempted all of the questions and there was no evidence that candidates were short of time.

- Q.1(a)(i) The majority of candidates were able to pick up at least one mark. However, it was evident that some had not read the question properly and did not answer in terms of a scan that was carried out before the investigation.
- Q.1(a)(ii) Examiners were disappointed at the number of candidates that simply stated 'x-rays are harmful' without any further qualification. This was not deemed an A2 level response and, hence, was not credited.
- Q.1(b)(i) A large number of candidates made this calculation a lot harder than it was. It was a simple  $28 \div 2.3$  but it was surprising the number of candidates that had tried to multiply by a factor of 10 at some point in their calculation.
- Q.1(b)(ii) Many candidates gained one mark for stating that there may be a link between the size of the follicle and the number of ovulations. This showed that candidates were using their knowledge and applying it to a specific context, which was excellent. However, few candidates included any further qualification to back up this statement and gain the second available mark.

### Teaching tip

When teaching new topics try and get the candidates to be more active in their learning. Ask them to suggest what will happen in certain investigations or what an answer is before you tell them. The key point here is to get the candidates to explain why they came up with the decision they made. This may encourage them to provide reasons for their suggestions in an exam paper.

- Q.1(c)(i) A number of candidates were able to pick up at least one mark in this question. Some confused mono- and dizygotic twins, and there were some references to vanishing twin syndrome. A few candidates thought that the woman would have two periods or that the next period would be heavy.
- Q.1(c)(ii) The majority of candidates scored the two marks available in this question.
- Q.1(c)(iii) A well answered question with most candidates scoring at least one mark. The most common correct answers referred to increasing the number of women and the length of the study.
- Q.1(d) Many candidates gained the one mark available here. There were quite a few vague references to fertility treatment that were not credited unless qualified further. Also, there were a number of references to the information being used to make a contraceptive pill (to stop women ovulating). This was not credited since, if this kind of medication was available to women, it could get into the water supply and lead to widespread infertility.

- Q.2(a) Many candidates gained credit for realising that oxygen and glucose are needed by the brain, but few were able to gain more than one mark as they did not elaborate on this and often simply reworded the question in their response. A common statement was to say that 'the brain is continuously respiring'. This was not enough to get the second mark point since it did not really imply a high rate of respiration. There were very few references to removing waste products.
- Q.2(b) The majority of candidates gained one mark for stating that it was an automatic response or words to that effect. Few made the connection with the autonomic nervous system and often gave irrelevant examples like the blink reflex.
- Q.2(c)(i) Many candidates gained one or two marks here, although they often struggled to get any more than this. Very few referred to arterioles in their answer and consequently lost their first mark. Many made a correct reference to blood clotting due to increased blood pressure and some that the clot may break away and block other vessels etc. Candidates seemed to get the sequence mixed up and many thought that the blood clots to repair the damage in the wall of the arteriole. Few realised that it is the atheroma that forms in the damaged wall making it more likely that a blood clot will form on it.

### Teaching tip

The following activity may help candidates understand the effect that high blood pressure has on the arterioles.

You will need:

A toilet roll tube, sand paper, sticky tape and red wool cut into very small pieces.

Activity:

1. The toilet roll tube is the arteriole ('roll' and arter'iole' sound the same so it may help them to remember that it is the arteriole). Use the sand paper to rub gently on one section of the inside. This is to simulate normal blood pressure. The students should notice that it has little effect on the arteriole.
2. Rub more vigorously on the same section. This simulates high pressure. The students should notice that this causes damage to the wall of the arteriole. Explain that when blood is travelling at high pressure it causes more friction and therefore, more damage to the walls.
3. The sticky tape is the macrophages, cholesterol, and fatty deposits etc. that make up an atheroma/plaque. Roll the tape into a sticky ball and place it over the damaged (sand papered) area.
4. The red wool is the blood. Throw a handful down the toilet roll tube. Some should stick, showing that a blood clot is more likely to happen.
5. Explain that, if the blood clot gets big enough, it can break off due the high pressure of the blood passing by. The clot can then get stuck in a thinner vessel (i.e. a capillary), cutting off the blood supply to the area beyond the clot.
6. Using the taps at a sink is good way to get students to visualise the difference in pressures. Put the tap on a little to show low pressure (not much force) then put it on full to show high pressure (a lot more force).

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- Q.2(c)(ii) Most were able to gain at least one mark. The most common answers were smoking, obesity and too much salt in the diet. The most common failure to gain the mark was by talking about 'poor diet' or 'too much cholesterol in the diet' or 'too much fat in the diet' unqualified. A few candidates seemed to confuse a risk factor with the cause of a stroke and referred to a blood clot in the brain as a risk factor.
- Q.2(d)(i) This question was answered well and the majority of candidates were able to score the three marks available. A few made vague statements to the body being x-rayed. Since the question specifically asked how a CT scan of the brain was carried out, this was not credited unless the candidate referred the brain or head at some point in their answer. Some candidates mistakenly described the 'use of magnets'.
- Q.2(d)(ii) Again, the Examiners were pleased to see that this question was answered well by the majority of candidates. Nearly all gained a mark for stating that the information gained allowed doctors to pinpoint the site or extent of the damage caused. Many went on to describe why the follow up scan might show the progression of the damage done. A few said the information might be used to decide on treatment.
- Q.2(e)(i) Many and varied responses to this question. Many candidates were able to gain the cerebral cortex and the medulla marks.
- Q.2(e)(ii) Most candidates made vague references to 'brain damage' but did not go any further than to reword the stem in their answer and so often did not even gain the 'nerve damage' mark. This was expected since it was a high targeted question. Very few referred to the build-up of scar tissue. But, those that did tended to go on and say everything else on the mark scheme and gain 2 max.
- Q.3(a)(i) The majority of candidates were able to correctly identify process Y as photosynthesis. Process X (respiration) was often confused with combustion or decomposition, and a few candidates identified the correct processes but put them the wrong way round.
- Q.3(a)(ii) This question was generally well answered with most candidates scoring the two available marks. Those that correctly identified a human activity to get the first mark point usually went on to state the impact on the carbon cycle and get the second mark point. There were a few candidates that did not relate their explanation to the carbon cycle, so did not gain the second mark.
- Q.3(b)(i) This question was well answered with a high number of candidates easily scoring the maximum marks available. There are still quite a few candidates referring to 'making', 'producing' and 'creating' energy. This is not credited at any point in the Specification.
- Q.3(b)(ii) The candidates' responses to this question were varied. Some easily scored the three marks available. However, a number gave very confused answers. It was surprising the number of candidates that thought maize and cattle are themselves decomposers. There were also quite a few references to decomposers 'eating' dead plants and animals. Examiners agreed that this was not worthy of credit at A2 level.
- Q.3(c) It was pleasing to see the number of candidates that could correctly work out this calculation. Especially since it was a high targeted calculation. Performance seemed to be Centre-specific, and it was clear that some Centres had spent time going through this type of calculation.

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- Q.3(d) As stated in the general comments section, Examiners have particularly noticed an improvement in candidates' responses to questions involving data interpretation. In previous sessions, candidates would tend to do poorly on describing and comparative data sections and pick up most of the marks for their explanations. However, this session, the majority of candidates reached the maximum for the describe section of this extended writing question.  
A few confused fertiliser with pesticides and herbicides or thought that the graph was showing the production of crop / food. Some candidates did not give units and / or a time reference and hence, did not gain credit when quoting comparative figures.
- Q.4(a) The majority of candidates were able to pick up at least one mark for stating that glycogen is broken down by an enzyme. A surprising number stated that the enzyme is glucagon, which is a hormone.
- Q.4(b)(i) This question was aimed at the more able candidates, but Examiners were pleased to see that a number of candidates made the connection that phosphorylating glucose would make it more reactive or allow it to continue to the next step.
- Q.4(b)(ii) A number of candidates were able to use Fig. 4.1 to work out that the net gain of ATP is 2, although some put 32 and others just guessed.
- Q.4(c) This question was, on the whole, poorly answered. Most candidates referred to glycolysis in detail and failed to mention anything regarding the general purpose and function of enzymes. Many stated that enzymes are needed for named stages but did not go on to explain why. A few of the better responses described enzymes providing alternative pathways, which Examiners thought was worthy of a mark as an 'AVP'.
- Q.4(d) This was a high targeted question and, therefore, it was pleasing to see that a number of candidates were able to pick up one or two of the marks. Quite a few gained marks for linking it to the electron transfer chain (AW) and/or that more ATP was produced. Some better candidates gave more detail and good descriptions of chemiosmosis, which the Examiners credited.
- Q.4(e) The majority of candidates were able to identify active transport as the correct method of movement. Some candidates described pyruvate 'diffusing in by active transport' or that it moves from 'a high to a low concentration'. Neither of these statements was credited.
- Q.5(a)(i) Surprisingly few candidates gained two marks. Many stated that ATP is needed for muscle contraction, but few said that lots of ATP was needed. A number of candidates said that the mitochondria are the site of ATP production, but few stated that aerobic respiration occurs here. Many of the statements made by candidates were correct but did not answer the question.
- Q.5(a)(ii) Many varied answers, but mostly wrong. A number correctly identified 'P' as the sarcomere but few got the A band (Q).
- Q.5(b) Generally well answered. Candidates could either do this, and gain many of the available marks, or were totally unable to do so throughout. There was a pleasing number of maximum marks in this section. Some candidates were a little confused by the roles of troponin and tropomyosin, but most were able to gain either mark point 1 or 2. Mark points 3, 4, 5, 8, 9, 10 and 11 were often given but the most common error was the assumption that the energy from ATP is used to cause the tilting of the myosin heads. A few candidates gave the other mark points, but all were given at some point, so all were accessible.

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- Q.6(a)(i) Many candidates gave a correct description of endometriosis to get one mark. However, few went on to provide enough detail to gain any further credit. Some stated that tissue from the endometrium can be found in other parts of the body but did not take it any further to say that it could be found in the oviducts (which is what would cause the problem). Also, many stated that the ova could not get passed the blocked oviduct but did not elaborate on this to gain credit for mark point 3 (that it would prevent fertilisation). A number of candidates incorrectly stated that endometriosis was the result of a problem with the endometrium in the uterus not developing enough.
- Q.6(a)(ii) The majority of candidates gained the mark available for this question. A few just stated 'surgery', which was not credited unless qualified (e.g. to unblock / remove endometrial tissue from the oviducts).
- Q.6(b) Most candidates were able to score at least one mark in this section. A few answers were too vague to credit and some stated male causes of infertility but, on the whole, it was well answered.
- Q.6(c)(i) Unfortunately, the most common answers to this question related to 'only the strongest sperm surviving' and 'giving the donor time to change his mind'. Many of the candidates that did realise that the sperm samples would be tested did not link it to testing of infectious diseases or that these may take time to show up. Candidates often stated that it would be tested for genetic diseases which, although true, is not the reason the samples need to be kept for at least 6 months.
- Q.6(c)(ii) Examiners were disappointed at the level of response for this relatively low targeted question. The majority of candidates that did realise this question related to movement of water (i.e. osmosis) scored the maximum of three. However, many referred to the sperm becoming capacitated or that the isotonic solution would keep the sperm clean, sterile and provide it with energy. A few stated that it would keep the temperature the same so that the sperm would not die.

## 2867 Genetics, Homeostasis and Ageing

It was encouraging to see that most candidates attempted all parts of all the questions and there was little evidence to show that any of the candidates had run out of time. However, as in previous sessions, answers to synoptic questions often lacked scientific detail. The essay-style questions 3(b) and 4(b) scored well with the majority of candidates also gaining QWC marks on these questions. Q.7 proved problematic for many candidates and few marks were achieved, possibly due to the higher demand of the questions or due to candidates tiring at the end of the question paper. Overall, most candidates scored low marks within the D/E grade boundaries.

- Q.1 Overall this question allowed most candidates to achieve some marks with synoptic answers being required as well as A2 knowledge of transplant surgery.
- Q.1(a)(i) It was pleasing to note that most candidates were able to offer an explanation for the terms in italics and many had an understanding of a 'chronic' disease being one in which symptoms develop slowly.
- Q.1(a)(ii) The most common answer gaining one mark for this question related to the baboon organ having 'foreign antigens'.
- Q.1(b)(i) Most candidates had a good understanding of the term 'species', but few were able to identify 'genus' as a group of similar species. One mark achieved for this part of the answer was generally given for candidates who identified a 'genus' as a group of organisms with some characteristics in common.
- Q.1(b)(ii) Organs of 'similar size' was the most common answer for this part of the question, although some candidates correctly stated that both species were 'primates'.
- Q.1(c)(i) Most candidates were able to identify 'X' as the best source of donated organs, but as two answers were required, some failed to gain one mark for this part of the question.
- Q.1(c)(ii) Candidates rarely scored more than one mark for this part of the question.
- Q.2 Apart from the calculation of magnification, this question was generally well answered by the majority of candidates.
- Q.2(a)(i) Most candidates gained the correct answer of 'ultrafiltration'.
- Q.2(a)(ii) Calculating magnification proved difficult for some of the candidates and few of these appeared able to use the scale bar correctly in their working. Centres are advised to practice manipulation of the equation and offer candidates further opportunities to calculate magnification when carrying out practical activities involving microscope work.
- Q.2(a)(iii) Many candidates were able to gain marks for correctly referring to 'podocytes' and describing their role in the functioning of the Bowman's capsule.
- Q.2(b)(i) Some of the candidates were able to suggest a meaning for 'inert' for one mark.
- Q.2(b)(ii) Most candidates were able to place the numbers stated into the given formula for calculating GFR, and although in this case the calculation was straightforward, Centres are advised to remind candidates that a calculator may be used during this paper.

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- Q.2(b)(iii) This part of the question was well answered by the majority of candidates, although some candidates simply stated that the filtrate does not contain 'proteins' rather than 'large proteins', which failed to achieve the marking point.
- Q.2(c) Many candidates were able to score at least one mark for this part of the question.
- Q.2(d) It was clear that the majority of candidates knew that haemoglobin was associated with erythrocytes, but some failed to achieve the marking point due to the misconception about the fact that it is found 'attached' to the erythrocytes rather than 'within' them.
- Q.3 Generally, candidates showed some understanding of the principles of a genetic disease and the majority could identify haemophilia as sex linked. However, part (c) (ii) was poorly answered.
- Q.3(a)(i) Many candidates were able to state the meaning of the term 'inheritance'.
- Q.3(a)(ii) The most common correct answer referred to 'mutation', but few candidates were able to score more than one mark.
- Q.3(a)(iii) As with (a)(ii), few candidates were able to score more than one mark for this part of the question with the most common answer referring to 'pedigree analysis'.
- Q.3(b) This part of the question allowed many candidates to achieve at least three to four marks by correctly referring to haemophilia as a sex-linked inherited disease affecting males, and most candidates were awarded the QWC mark.
- Q.3(c)(i) Many candidates were able to achieve at least one mark with the most common answer referring to there being 'less chance of infection'.
- Q.3(c)(ii) This question was poorly answered and few candidates were able to apply their knowledge to suggest suitable answers. Some candidates were able to obtain one mark for understanding that Factor VIII may be broken down by the body or that it can not be made.
- Q.4 Overall, candidates showed an understanding of the homeostatic mechanisms regarding control of blood sugar, and there were some good answers seen for the essay-style question in part (b).
- Q.4(a) Most candidates gained at least one mark for including 'negative feedback' in their answers, but some did not achieve the full three marks as they failed to elaborate and 'describe' how it operates.
- Q.4(b) This part of the question was well-answered by the majority of candidates and it was pleasing to see the correct scientific terms being used in context which allowed for the awarding of the QWC mark to some of the candidates. Unfortunately, some candidates incorrectly referred to insulin being secreted by alpha cells and vice versa for glucagon, which lost them marks.

**Teaching tip**

Candidates could be advised to learn a method of remembering which cells in the pancreas secrete insulin and glucagon e.g. glucagon has an 'a' in its name so 'alpha' cells secrete it.

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- Q.4(c)(i) Many of the candidates correctly stated hypoglycaemia.
- Q.4(c)(ii) Generally well answered with many candidates able to achieve at least two marks for this part of the question.
- Q.4(c)(iii) Few full-mark answers were seen for this question and some candidates mistook the question as referring to 'high blood sugar'.
- Q.4(d)(i) Both marking points were seen as alternative answers by candidates who correctly answered this question.
- Q.4(d)(ii) Examiners were looking for dividing cells being 'destroyed' by the chemotherapy and vague answers referring to cells being prevented from dividing did not receive credit.
- Q.4(d)(iii) Generally well answered, but as the question referred to the 'patients' answers involving the umbilical cord were not credited in this context.
- Q.4(d)(iv) Few candidates scored the full three marks for this part of the question, but it was encouraging to see scientific terms such as 'multipotent' and 'differentiated' being used.
- Q.5 Overall, candidates did not score as well as expected on this question. Interpretation of graphs is a skill that continues to elude some candidates and a number still can not distinguish between the terms 'describe' and 'explain'.
- Q.5(a)(i) Some candidates 'explained' the results shown by the graph which failed to gain credit. Few candidates were able to gain the full three marks.
- Q.5(a)(ii) This part of the question was poorly answered and rarely were full marks seen by the Examiners. Deterioration (or death) of neurones was the most commonly seen answer deserving of credit, with some candidates referring to deterioration of sense organs such as the eye, which was also worthy of credit.
- Q.5(a)(iii) Many candidates were able to gain credit for referring to the blink test as being 'involuntary' and 'simple to conduct', but few candidates scored more than two marks.
- Q.5(a)(iv) This part of the question was well answered.
- Q.5(b)(i) Generally well answered with most candidates gaining credit for describing the effect of cataracts as a cause of poor vision. Candidates stating more than one cause were only credited for one answer and it is vital that candidates read the question carefully, paying particular attention to statements that appear in bold.
- Q.5(b)(ii) The majority of candidates now have a good understanding of social issues surrounding ageing and this part of the question scored well.
- Q.6 This question contained synoptic elements, which were generally within the grasp of many of the candidates. Overall, candidates showed good knowledge and understanding of Klinefelter's syndrome.
- Q.6(a)(i) The majority of candidates were able to gain at least one mark for this part of the question, but some unfortunately were confusing 'chromosome' mutation with 'gene point' mutation, which failed to gain credit.
- Q.6(a)(ii) Some candidates were able to answer this question, but others failed to understand that many genes are affected by a chromosome mutation.

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- Q.6(a)(iii) Candidates needed to understand the term 'syndrome' to be able to offer appropriate answers for this part of the question and the majority of correct answers referred to the fact that syndromes 'affect many organs'.
- Q.6(b) This part of the question was generally well answered by the majority of candidates.
- Q.6(c)(i) Apart from some candidates repeating the wording in the question stem, many candidates were able to suggest appropriate reasons such as lack of testosterone and feminine characteristics in their answers.
- Q.6(c)(ii) There were some good answers seen for this part of the question with the majority of candidates referring to IVF and testosterone injections.
- Q.6(c)(iii) The majority of candidates found it difficult to relate ethical issues to this specific case of Klinefelter's, and some answers were not in context and failed to gain credit.

**Teaching tip**

Centres could devise a series of scenarios for candidates to debate regarding social and ethical issues. Hopefully, this would help prevent candidates listing all the ethical issues they are aware of in examination situations rather than referring to the specific case study in the question.

- Q.7 Overall, this question was poorly answered and the concepts of genetic engineering and the Human Genome Project did not illicit good responses from the majority of candidates.
- Q.7(a) Most candidates were credited for describing the structure of the plasmid as a 'circle of DNA' but few candidates received more than two marks for explaining why they make good vectors.
- Q.7(b)(i) This part of the question enabled candidates to achieve marks for correctly referring to 'sticky ends' and 'palindromic' or 'complementary' sequences and most were able to gain at least one marking point.
- Q.7(b)(ii) This part of the question was often misunderstood and many candidates tried unsuccessfully to explain the specific role of DNA ligase without including an explanation of enzyme action, which would have enabled them to access further marks.
- Q.7(b)(iii) Few correct answers were seen for this part of the question.
- Q.7(c)(i) There were few credit-worthy answers seen for this part of the question on the Human Genome Project. Candidates gaining marks referred to identification of genes causing abnormal proteins, but some candidates were unable to use appropriate wording to gain credit.
- Q.7(c)(ii) Generally most candidates were able to gain one or two marks for answers which referred to access to information and discrimination but full marks were rarely seen.

# Grade Thresholds

Advanced GCE Human Biology (3886. 7886)  
January 2009 Examination Series

## Unit Threshold Marks

Unit		Maximum Mark	a	b	c	d	e	u
2856	Raw	60	49	43	38	33	28	0
	UMS	90	72	63	54	45	36	0
2857	Raw	60	39	34	29	25	21	0
	UMS	90	72	63	54	45	36	0
2858/B	Raw	120	95	84	73	62	51	0
	UMS	120	96	84	72	60	48	0
2866	Raw	90	66	58	51	44	37	0
	UMS	90	72	63	54	45	36	0
2867	Raw	120	87	77	67	57	47	0
	UMS	120	96	84	72	60	48	0

## Specification Aggregation Results

Overall threshold marks in UMS (i.e. after conversion of raw marks to uniform marks)

	Maximum Mark	A	B	C	D	E	U
3886	300	240	210	180	150	120	0
7886	600	480	420	360	300	240	0

The cumulative percentage of candidates awarded each grade was as follows:

	A	B	C	D	E	U	Total Number of Candidates
3886	2.5	17.3	48.1	79.0	97.5	100.0	82
7886	0.0	14.3	38.1	76.2	100.0	100.0	23

**105 candidates aggregated this series.**

For a description of how UMS marks are calculated see:

[http://www.ocr.org.uk/learners/ums\\_results.html](http://www.ocr.org.uk/learners/ums_results.html)

Statistics are correct at the time of publication.

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