

Human Biology

Advanced GCE **A2 7886**

Advanced Subsidiary GCE **AS 3886**

Report on the Units

January 2007

3886/7886/MS/R/07J

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All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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Advanced Subsidiary GCE Human Biology (3886)

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Chief Examiner's Comments

This examination series saw another increase in entries at both AS and A2. There was also saw a significant increase in the number of centres at AS. This shows that the specification continues to be well received. Candidates and teachers are clearly enjoying the context-based approach and the intrinsic interest of the topics. The enthusiasm and thorough learning of the content of the specification shown by many of the candidates, has made it possible for them to achieve their full potential. We would like to congratulate Centres on this positive approach. In particular the quality of responses dealing with ethical issues was noticeably further improved in this series.

As usual, great care was taken to ensure comparability of standards between GCE Human Biology and GCE Biology. The standard of response required by the mark schemes was in close alignment.

The entries for units 2857, 2858 and 2867 consisted of small cohorts of candidates resitting from 2006. This strategy is well informed as it allows candidates to improve their UMS scores. However, there was evidence that many resit candidates had not shown significant improvement in performance and may perhaps have received less support than candidates in the summer examination series. Teachers may wish to review the arrangements they have in place for supporting candidates resitting examinations.

There was evidence that many of the weaker candidates consistently lost marks due to poor quality of written expression. Examiners felt that these candidates probably understood the biology being tested even though their responses did not provide sufficient clarity to award the marks.

As an Advanced Level Science, Human Biology requires an appropriate standard of literacy, which includes the specialist vocabulary associated with the learning outcomes. Centres are reminded that definitions should be learned for all the terms emboldened in the specification. The endorsed textbook covers these terms and good definitions can usually be found at en.wikipedia.org

This series highlighted once again that many human biology candidates use words inappropriately in the biological context. For example, candidates do not have a clear understanding of what can 'die' or how to use the word 'wall'. Teachers are advised to spend an appropriate amount of time to try and improve understanding in this area.

Teaching tip

Weaker students benefit from high levels of repetition and reinforcement. Starter and plenary activities can be used to provide frequent recaps of previously covered material. Key terms and definitions can easily be recapped with question loops.

Understanding the questions

There was evidence from the responses to some questions that candidates did not fully understand the questions being asked and instead answered the questions they thought or assumed were being asked.

Candidates showed good responses to questions that demanded straight recall or to explain information provided. However when questions required candidates to apply their knowledge to specific situations they produced much poorer responses.

Teaching tip

Encourage candidates to distinguish between stimulus material that sets the scene of the questions and data in the stems of questions that is required to answer questions. Train students to understand that the command 'Use information from...' means exactly that.

Pleasingly, rubric infringements were less common than in previous series. However, some candidates continue to ignore commands such as 'State **two**'. Candidates should be made aware that ignoring rubric does not advantage their responses and in some cases may lead to them scoring lower marks.

Teaching tip

There are plenty of past papers available for this specification. These can be used to help students develop the reading and comprehension skills required. Attention should be given to training students to follow rubrics.

Information, Tables and Graphs

The graphs used in this series did not appear to pose significant difficulties to the candidature. The same was not true however of the tables where students encountered more problems comprehending the data.

Teaching tip

Teachers would be well advised to practise converting information from tables. Many tables in human biology show different groups within a population – which in many instances are the results of an investigation and do not always show the whole population. Candidates can only benefit from exercises based round tabulated information.

Mathematical requirements

This series saw statistical tests featuring in 2867. Teachers would be well advised to use this question when teaching students and to read carefully the examiners report.

Presentation

The standard of presentation is not assessed generally when marking Human Biology papers and the examiners try extremely hard to decipher particularly unclear handwriting but the risk to the candidate is obvious.

Diagrams and flow charts are acceptable parts of a candidate's response but should always be annotated.

Teaching tip

Student could be made to answer certain past paper questions solely with the use of annotated diagrams. This would increase their awareness that this is a legitimate strategy in the exam hall.

The language of written responses for the longer questions at times led to candidates failing to score marks even though the examiners felt that the candidates probably knew the biology required. Examiner can only give credit for what is presented to them so it is therefore important that candidates communicate their ideas clearly in writing. Although examiners are aware that Centres are continually aiming to develop their candidates written communication skills, it is still an area of weakness and should be given due attention in the delivery of this course.

INSET

OCR is offering a programme of in-service training for teachers on the delivery of the specification during the Autumn 2007 and Spring 2008 terms. The booklet containing details of these INSET courses will arrive in centres during the Summer term 2007. This booklet contains full details of the courses listed below and will also be available on the OCR website. Alternatively further information may be obtained from the OCR website (www.ocr.org.uk) or by telephone on 0121 628 2950.

2856 - Blood, Circulation and Gaseous Exchange

General Comments

Candidates achieved a wide range of marks for this paper. It was pleasing to see that even where candidates were struggling, there was good evidence of knowledge and understanding which indicated an interest in the subject. Candidates were able to attempt all questions on the paper with very few areas proving inaccessible. The teaching of this unit had clearly prepared the candidates well and they were almost without exception able to display the knowledge they had gained in the exam hall.

Candidates did not always seem aware that the tariff of questions should be reflected in the responses given. Examiners saw very good candidates give one reason or explanation where two were required. A good example of this would be question 4(c)(i).

Candidates found it difficult to relate their knowledge to specific situations. Question 1 exemplified this well. Part (a) was answered very well but (c)(i) and (c)(ii) was answered less well, yet arguably (c)(i) was one of the most accessible questions on the paper if the context was understood.

Teaching tip

This unit has a very extensive list of testable learning outcomes. Constantly encouraging students to take ownership of their own learning and to mark off each learning outcome when it has been covered can help develop an awareness of the amount of content to learn in this unit.

Comments on Individual Questions

- 1 This question was intended to be a question on a familiar topic which was accessible to candidates. Though few candidates scored few marks, in many cases candidates did not answer fully enough to earn all the marks available.
- (a) A well-answered question to which examiners reported that candidates followed the rubric well. Most candidates scored at least four marks on this question.
 - (b) Although the graph was very common and clearly familiar to lots of candidates, the question posed was different to the one many candidates expected. The correct response to the question posed was a single horizontal line between the two dashed lines on the graph. However examiners were able to give full credit to candidates that correctly showed the change in energy as a reaction progresses when enzymes are present.
 - (c) (i) Most candidates saw how to apply their knowledge of enzymes to this specific situation. Unfortunately some of the weaker candidates could not see that fibrinogen was the substrate in this instance.

(ii) Examiners saw surprisingly few references to enzyme substrate complexes here. In general, however, the question was answered very well by candidates who had correctly identified an increase in (i)
 - (d) Generally well answered with a wide range of acceptable responses. Some candidates however did lose a mark for simply stating an anticoagulant rather than naming one.

Teaching tip

Get students to practice questions where the theory is set in more than one context to help them see how the context does not change the principle.

2

- (a) Biochemistry continues to remain a mystery to many weaker candidates and this question often yielded four marks for A grade candidates but fewer for E grade candidates.

(i) This specification only requires the structure of Alpha glucose so it surprised examiner to see so many students drawing Beta glucose.

(ii) This question was well answered and it was pleasing to see that the vast proportion of weaker candidates were able to state the correct answer.

(iii) A large number of candidates chose to write maltose rather than the specification term disaccharide. Examiners were of course able to credit maltose as well as dimer.

(iv) This question was intended to be discriminating and proved to be so. Only the most able candidates were able to explain that glucose could be broken down in stages.

(b) Nearly all students were able to identify the sequence of events in the procedure.

(c) (i) Z was, as expected, the normal response. Of the candidates that gave an incorrect response, X was the preferred option.

(ii) Water potential is a difficult concept and it pleased examiners to see a reasonable proportion of candidates clearly identify the effect of too much glucose on water potential and determine the subsequent direction of osmosis.

- 3** The majority of candidates were able to secure some marks on this question mainly by describing the features of the alveoli that allow efficient gaseous exchange. Weaker candidates secured 2-3 marks based on knowledge of respiration from Key Stage 3 (Sc 2) regarding large surface area, good blood supply and thin walls. Good candidates were able to describe the process of gaseous exchange using key terms such as diffusion and concentration gradients, but weaker candidates simply described the 'passing' of the gases.

Misunderstanding as to 'walls' and 'membranes' led to loss of marks for a number of candidates. Alveoli were occasionally referred to incorrectly as 'cells' and hence had either 'thin cell walls' or 'thin cell membranes'.

Many stronger candidates romped through this question producing some excellent responses.

It has to be pointed out that moisture is an inevitable consequence of having squamous epithelial cells exposed to air. In terms of gaseous exchange it is at best neutral. Teachers are advised to help candidates 'unlearn' the common misconceptions they arrive with at the start of an AS programme.

Teaching tip

Wall and membrane cause immense difficulty to weaker students. Any interventions to continually explain the difference can only help students gain fundamental comprehension.

4 Probably the least well answered question. Many candidates achieved maximum marks in parts (a). Part (b) was answered well by the more able candidates and part (c) was somewhat independent of the candidates' ability. Some candidates simply failed to understand the table and this meant their answers to all three parts were poor.

(a) This question usually produced two good responses. Examiners reported that this and question 6(b) produced the most rubric infringements. Candidates can only lose marks by failing to observe emboldened instructions in question stems.

(b) While there were some excellent answers that obtained all the marks available, some answers were fairly dismal and scored one or two at best. Cilia dying, alveoli bursting and tar coating everything in sight featured in some of the less scientific responses.

(c) (i) Surprisingly less than 70% of candidates got this correct and candidates displayed all sorts of wonderful maths to gain some peculiar answers.

(ii) This AO2 question required mention of both missing categories to secure both marks. Many very good candidates were unable to see that a single response would not adequately answer the question.

(iii) Many candidates talked about women giving up smoking during pregnancy which, of course, means that they did smoke at some time in their lives so weren't answering the question. "Going down the pub" seemed to be the favourite response of weaker candidates. A large number of candidates correctly identified that historically smoking was more of a male preserve. Approximately half of the candidates that went down this track could not resist continuing to describe how trends are now changing and proportions of females to males smoking is changing – which although very interesting did not answer the question posed.

Q.5 (a) (i) Atheroma was correctly labelled by most candidates and it was pleasing to see that even the weaker candidates had no difficulty following the directions. Approximately 5% of candidates did not attempt this question which examiners felt was due to them simply missing its presence.

(ii) Examiners were looking for references to heart *tissue* or to heart *muscle* in candidates' responses. However, many candidates stated something along the lines of the following response.

“coronary arteries take blood to the heart. It then passes through the atria and ventricles and is then pumped to the lungs”

(iii) Apart from an obsession with dietary cholesterol, this question was well answered. It is important to realise that being male is the risk factor not gender.

- (b) (i) A straightforward recall question which was answered correctly by only about 30% of the candidature.
- (ii) This question was a higher demand question and indeed only the most able candidates were able to express in words the role of the elastic tissue.
- (iii) Other than the failure of some students to actually talk about cytoplasty this question was well answered.

Teaching tip

Even very able students find putting thoughts into words difficult. Interventions that force students to convert information from bullet points to prose can help them build up the skills of expression prior to producing totally free response questions.

- Q.6** (a) (i) This was intended as a lower demand question and the vast majority of candidates got this right using one of the accepted terms. Occasionally, students incorrectly referred to respiratory arrest or a stroke.
- (ii) Many students easily scored all three marks with a few well chosen words, such as; "two fingers used to find radial pulse on the wrist". If all this detail was not included, then the majority still picked up all three marks by correct reference to counting in a particular time period. Some mentioned the use of fingers, without the required reference to two fingers. More than one student wrongly advocated the use of the two index fingers. Often a reference was made to a named artery, commonly the carotid (often spelt wrongly) or the radial artery. Unfortunately quite a few candidates referred to veins not arteries. References to the exact location of sites were not detailed enough, in most cases, to show with confidence a real ability to locate the site - e.g. below the jaw. Descriptions of stethoscope use featured in some answers but usually did not give enough detail. A few answers referred to methods for measuring blood pressure not the pulse. One or two wanted to use an ECG machine so did not describe a manual approach. One candidate outlined the method for chest compressions.
- (b) The most common correct answer was 'heart block'. It was good to see a simple mention of heart block, but in some answers there was clearly confusion in what this constituted as candidates either directly referred to, or implied, physical blockages (to the heart or coronary system). Some incorrectly answered 'blockage' in this context. References to the conducting system of the heart were less successful. Quite a few candidates did give a correct reference to a problem at the AV node (not functioning, a delay at, etc.) However many referred to the SA node or failures in transmission of the signal from the SAN to the AVN. Some correctly mentioned the Purkyne tissue (usually to gain the second mark in conjunction with a reference to the AV node or heart block), while a few correctly referred to the bundle of His. Generally only the most able candidates scored both marks on this part question.

2857 - Growth, Development and Disease

General Comments

This paper produced a wide range of marks and provided a very positive examination experience for the majority of candidates. The questions were straightforward and each question and part question proved to be accessible to the candidates.

A number of candidates are still failing to read questions carefully and failing to include sufficient information to gain high marks on the extended answer questions **Q.4 (a) iii and Q.4(c)**.

Some candidates are still experiencing difficulty in calculating percentages and this was reflected in many poor responses to **Q.4 (a) ii**. Candidates need to be given opportunity to practise this numerical skill where appropriate during the teaching of the course.

Comments on Individual Questions

- 1 This question was quite discriminating. Some A grade candidates gained almost full marks (15), whereas lower attaining candidates often scored 5 or 6 marks.
 - (a) Most candidates showed a good understanding of the properties of stem cells and scored full marks on this section.
 - (b) Some candidates failed to gain marks on this section because they did not use the term 'cells' in their answer. They should have described how the stem cells might differentiate to produce heart muscle cells to replace the damaged heart cells.
 - (c) Many candidates answered this part well and described appropriate ethical issues. Some candidates only gained one mark because they repeated or extended their first answer rather than describing a second issue.
 - (d) (i) Most candidates gained at least three marks in this question by correctly identifying the stages of mitosis. However few gained full marks because they were unable to describe the behaviour of the chromosomes. In particular they did not use the term chromatid correctly and were confused about the changes that take place to chromosomes during telophase.
 - (ii) Very few candidates gained full marks on this question. Some gained one mark for stating that the cells produced by mitosis are **genetically** identical but only one or two candidates went on to say that this is necessary if the new cells produced are to develop into the same type of cell to carry out the same role.

Teaching tip

After teaching mitosis use one lesson to consolidate understanding by asking students to use stiff coloured wire or pipe cleaners to produce models of chromosomes at different stages in the cell cycle (interphase, prophase, metaphase, anaphase, telophase). Ask them to label their models using terms: chromatid; centromere; and chromosome. Then ask students to write a short paragraph describing the behaviour of chromosomes during one cell cycle.

- 2** Many candidates scored almost full marks on this question but some lost marks through lack of knowledge and understanding of the structure of prokaryotic cells.

(a) (i) and (ii) were well answered by most candidates who showed a good understanding of how the problem of MRSA arises and the precautions that need to be taken to reduce the spread of MRSA in hospitals.

(b) A surprising number of candidates were not able to correctly identify the loop of DNA and the cell wall of a prokaryotic cell.

(c) Many candidates answered this well, correctly describing how penicillin prevents the formation of the cell wall. However, some candidates confused antibiotics with antibodies and gained no marks.

Teaching tip

During revision present students with pairs of words that are often confused and ask them to distinguish between them (antibody / antibiotic, prokaryotic / eukaryotic, DNA / RNA, transcription / translation, B cell / T cell).

- 3** Many candidates scored almost full marks on this question but some lost marks through lack of knowledge of chromosomal mutations and how a karyotype is produced.

(a) Some candidates correctly stated that a chromosome mutation was a change in the number or structure of a chromosome but others were confused and described a gene or point mutation of DNA

(b) (i) Many candidates correctly identified the condition as Turner's syndrome but a few candidates thought that it was Klinefelter's syndrome or Down's syndrome.

(ii) Many candidates correctly stated that the karyotype had only one X instead of 2 X chromosomes but a few candidates missed this mark because they stated that the karyotype lacked a Y chromosome.

(iii) There were some very good answers to this part. Candidates described the procedure in detail and included many of the different marking points. However, a few candidates described how the foetal cells could be obtained by amniocentesis instead of how the karyotype was produced from foetal cells.

(c) Many candidates gave very well thought out answers to this question. They identified the relevant ethical issues and described the issues sensitively and carefully.

Teaching tip

Give students a selection of different unlabelled karyotypes. For each karyotype ask students to decide: the gender of the karyotype; whether it is normal or not and, if appropriate, the condition showed by the karyotype. Then ask the students to ring and describe the evidence that their decisions have been based upon.

4 This question was quite discriminating. Some A grade candidates gained almost full marks (17), whereas lower attaining candidates often scored only 4 or 5 marks.

(a) (i) Many candidates were able to explain that expressing the number of new cases per 100 000 population enabled comparisons to be made between regions with different sized populations. Some candidates were still not aware of this even though it has been set as a question before.

(ii) Many candidates calculated the percentage of global cases correctly but a surprising number (about 50% of candidates) found this difficult and did not gain any marks. A few candidates lost a mark because they did not, as requested, give the answer to the nearest whole number

(iii) This question was well answered by most candidates. Many candidates showed confidence in discussing a variety of causes of the differences in the number of new cases of TB in Africa and Europe. Some candidates discussed only one or two differences and so failed to get full marks.

(b) This question was answered well by most candidates. This was mainly due to the fact that most of the candidates will actually have had first hand experience of the Heaf test.

(c) This question was well answered by the higher attaining candidates. They gave clear, concise accounts:

describing how live attenuated bacteria are injected into the body and act as an antigen that stimulates an immune response; describing the process of clonal selection and clonal expansion of B lymphocytes; explaining how these cells differentiate into plasma and memory cells; that the memory cells stay in the circulation and recognise the TB bacterium should it enter the body; that they can differentiate straight away into plasma cells which make antibodies and help to destroy the bacteria before it can reproduce sufficiently to make the person ill.

Lower attaining candidates continue to find this topic difficult. Many thought that TB was caused by a virus and confused the role of B lymphocytes and T lymphocytes. Many were not sure about the link between the immune response stimulated by the vaccine and subsequent immunity to TB.

Teaching tip

This difficult and complex topic needs to be the focus of a revision session. Give students a list of all the relevant terms and ask them to work in small groups and write a definition for each term. Ask them to feedback to the class and sort out any misconceptions. Give groups sets of statements about the immune response and ask them to divide the statements into: antigen presentation, role of B lymphocytes, role of T lymphocytes, role of memory cells. Check grouping of statements and then get them to sequence the statements within each group. Finally ask students to individually produce a poster summarising the key stages of the different aspects of an immune response.

2858/01 – Case Studies

General Comments

All candidates sitting this paper in January are re-sit candidates and it was clear that the majority had carefully researched the case studies. Consequently, descriptions of the transmission of the cardiac impulse, CPR and measurement of haemoglobin were done well as was the question on angiogram and angioplasty differences.

Question 1 was the better answered of the two questions. In Question 2, many candidates scored low marks on part b due to their inability to describe the structure of DNA. Some candidates assumed single stranded DNA must mean RNA and answered the question accordingly with reference to DNA and RNA differences.

Teaching Tip

Laminate sets of the key DNA terms (nucleotide, deoxyribose, complementary base pairing, base names and so on).

Working in groups, and arranging the words to prompt themselves, use descriptions of a nucleotide, complementary base pairing and a full description of DNA structure as 'starters' and/or for revision sessions

It was pleasing to see evidence of research yet again, with some candidates referring to the viral capsid containing the DNA and the fact that slapped cheek is caused by a parvovirus and such responses were credited.

As in previous papers, questions relating to immunity, protein synthesis and biochemistry proved difficult for all except the most able candidates.

In the light of clear instructions given in the instructions to candidates on the front of the paper, it was disconcerting to come across 'additional answer sheets' attached to exam papers. The instructions are very clear – answers written in places other than those given for each question will not be marked. Invigilators are doing candidates a disservice if they continue to provide additional answer sheets.

Comments on Individual Questions

1(a)(i)(ii) Most candidates answered both of these correctly. The commonest mistake was to refer to 'the heart' contracting or 'atria and ventricles' contracting for part (i). In part (ii), candidates who referred to the filling time becoming 'quicker' were not credited – the implication being that the ventricles would be just as full despite the fact that the filling time was reduced.

(b) This was well answered by the majority of candidates and centres are to be congratulated on their teaching of the sequence of events. Careless use of terminology cost some candidates marks. Descriptions of the impulse passing 'through the atria' are to be discouraged – candidates need to make it clear that transmission is between muscle cells. The term 'myogenic' was frequently used although some candidates are clearly still confused and refer to 'the brain' stimulating the SAN.

- (c) There were some excellent descriptions of CPR although the examiners noted that, in many cases, the number of compressions recommended and the position of the hands given did not match current guidelines. Centres are advised to contact the Resuscitation Council (www.resus.org.uk) for up to date advice or refer to their publication 'Resuscitation for the Citizen' (7th Edition) published March 2006.
- (d) Candidates had clearly researched the procedure used for angiograms and many referred to the use of a dye to visualise the blocked or narrowed artery. Angiograms are not on the specification but it was possible to gain full marks by describing how angioplasty works. Both approaches were used by candidates and this question was well answered. However, vague references to one being a screening procedure and the other being a 'cure' were not credited.
- (e) The examiners were looking for responses which described the streptokinase acting as an antigen leading to the production of memory B cells by clonal selection and expansion such that a second challenge by the antigen would lead to a faster response with higher levels of antibody production by B lymphocytes or plasma cells. Such responses were rare with the word 'foreign' being used instead of antigen and few references to B or even T lymphocytes. Candidates referred to antibodies being produced and 'staying behind to fight the streptokinase' and there was considerable confusion as to the role of plasmin which was not relevant to this question. The immune system continues to prove an area of difficulty for all but the most able candidates.
- (f) Part (i) was designed to be accessible to virtually all candidates so it was surprising how many could not identify high and low density lipoproteins with the most common mistake being to refer to 'high density lipids'. In part (ii), most candidates were clearly aware the LDLs are 'baddies' and HDLs 'goodies' but only a minority could explain why in terms of the function of the two types. More candidates referred to the importance of the ratio of the two types and good candidates referred to the recommendations given in the case study and the need to measure blood levels of both types in order to see if guidelines were being met.

Part (iii) proved more difficult for candidates than the examiners anticipated. Biochemistry has always been a problem in many candidates' minds and this was also clear from Question 2 b. There were references to 3 molecules of glycerol joined together, peptide bonds, diagrams with incorrect formulae or labels attached and some confusion about the difference between saturated and unsaturated fatty acids. However, there were some excellent, concise descriptions and/or well labelled diagrams – the examiners were happy with the use of 'boxes' to represent the glycerol and fatty acids and the 'join' through an oxygen atom to represent the ester bond, as long as these were clearly annotated. Some candidates assumed the examiner meant 'phospholipid' and answered accordingly while other candidates attempted to produce diagrams of lipoproteins.

- (g) There was a lot of information given in the case study and in the stem of the question and many weaker candidates repeated this rather than used it. The examiners were looking for an awareness that candidates appreciated it was heart muscle cells that were deprived of oxygen – rather than vague references to ‘the body’ or muscles generally. The increase in LDH was stated in the question stem and it was the awareness that the rise in lactate would stimulate production of LDH leading to this increase that the examiners were seeking.
- 2(a) The question clearly asked for ‘pre-conceptual’ care and good candidates correctly used provision of folic acid or checks on Rhesus blood group and good reasons why were provided. Some candidates gave very imaginative answers such as ‘screening for STDs’ which would ‘give time to treat them before the baby was conceived as it (sic) could be passed to the foetus’. Weaker candidates either gave vague examples with reference to advising a ‘balanced diet’, or gave reasons involving foetal health i.e. post conceptual.
- (b) This question proved to be very difficult for candidates to access. Where marks were obtained, the candidates confined their answers to discussions of DNA **structure** with reference to both ‘being made of nucleotides’ and then giving a description of the key features of nucleotides. It proved easier for candidates to describe the differences with most spotting that Human DNA would be double stranded and a double helix. Good candidates then extended this further to describe complementary base pairing and hydrogen bonding. The weaker candidates did not distinguish between DNA differences between human cells and virus particles. It has always been the practice on this specification to reward evidence of further research. Therefore it was possible to score marks by referring to the virus ‘capsid’ containing the DNA but on the whole, weaker candidates limited themselves to describing the action of the virus – often quoting directly from the case study- and gained no credit for this.
- (c) The examiners were pleased with the number of candidates who could successfully describe the haemoglobinocyanide method. Good candidates described the procedure in great detail but even relatively weak candidates had a good grasp of the principle and references to the use of the colorimeter and the appropriate filter measuring the absorbance relative to a standard or control. There was confusion with the haemocytometer and, as the red blood cell concentration would be relative to the haemoglobin concentration, accurate descriptions of the method were accepted for a mark of 1max.
- (d) (i) In this question, the temptation to lift material directly from the case study proved too much for some candidates and consequently they scored no marks. However, a surprising number linked the viral DNA to its role in coding for viruses and, although few stated this, they correctly concluded that haemoglobin would not therefore be coded for and hence would not be synthesised.

TEACHING TIP

Many proteins and/or polypeptides will be encountered throughout the Human Biology Specification. Rather than talking about cells 'making' the protein, use the opportunity to re-iterate the key events in protein synthesis. For example, instead of 'Beta cells produce insulin' why not 'The gene for insulin is transcribed and translated in beta cells to make insulin'. This also serves to remind students that every cell in humans carries every gene. This is a bit cumbersome at first, but it does develop good 'synoptic thinking' skills. A 'concept map' to include all the proteins mentioned in the specification would be a good revision tool and would build on this

- (ii) Many candidates answered this well and grasped the idea that oxygen transport would be impaired already and, in effect, the concentration of (functional) haemoglobin would already be reduced – '...as the blood cells are oddly shaped, haemoglobin levels are reduced. Slapped cheek virus would reduce them even more'

- (e) This question was intended to be accessible to most students and this proved to be the case. Stem cell technology continues to make the news and candidates are very familiar with their key features. The examiners were, however, a little surprised by the use of 'chloroplast' by a small number of candidates. Does this indicate that 'stem' still triggers ideas of plant tissues? Similarly 'meiosis' as an option also caught out a small number of candidates. However, the majority of candidates obtained full marks for this question.

- (f) Amniocentesis, its timing, risks and its use in diagnosis of chromosome mutations is clearly indicated in the learning outcomes. Candidates were clearly aware of the risks posed by amniocentesis and this was the most common response. Many spotted that Lisa would have been far too late in her pregnancy for amniocentesis to be an option – 'amniocentesis is done around 15 weeks and the baby is in the third trimester of the pregnancy so this is too late'. However, the examiners were surprised at how few candidates questioned its use in the case of an infectious as opposed to a genetic condition.

2866 - Energy, Control and Reproduction

General Comments

This examination paper proved to be accessible for many candidates and the examiners noted some scripts that scored very high marks. Almost every candidate attempted all parts of the paper and there was no evidence of candidates running out of time in which to complete their answers.

The question which involved knowledge of a practical procedure was generally answered well and Centres are obviously encouraging their candidates to have first hand experience of these techniques. The topic area dealing with energy transfer in food chains does appear to be challenging even for the stronger candidates and the issues here seem to be as much to do with quality of expression as with the actual understanding of biological concepts.

Teaching tip

Ensure time is created in teaching schedules to allow time for interventions that force students to practice putting scientific ideas into their own words.

- 1** Some sections of this question were done well by the majority of candidates. It was evident from many candidates' responses, however, that the theoretical aspects of how genetic variation is brought about are not well understood; particularly the process and significance of independent assortment in meiosis.
- (a)(i)** Labelling the structures from the photograph proved difficult for many candidates. Commonly structure **A** was incorrectly identified as spermatid, primary spermatocyte or Sertoli cell. Structure **B** was labelled correctly more often, although it too was identified frequently as Sertoli cell or spermatid. The marking scheme allowed credit for simply stating the structure as sperm, sperms or sperm tail. It is important that candidates have the chance to practise identifying structures specifically referred to in the specification from photographs as well as from diagrams.
- (ii)** Many candidates knew that the role of the Leydig cells is to secrete testosterone. The most frequently seen incorrect response was the confusion between Leydig cells and nurse cells, with candidates referring to the cells 'protecting', 'nourishing' or 'nursing' the developing sperm.

- (b) The examiners were delighted with the number of correct sequences given in response to this question; few candidates made errors. Where confusion was seen, it was as a result of mixing up the urethra, epididymis and vas deferens.
Asking candidates to produce a piece of extended writing describing the journey of the sperm from their site of production to arrival in the oviduct is an effective (and often highly entertaining) way of summarising the work on the structure and function of the reproductive organs.
- (c) Once again, many candidates scored full marks on this part of the question; recognising the importance of water **not** moving either into or out of the sperm cells and the resultant damage caused if this were to happen. Disappointingly, many candidates are still referring to concentration gradient rather than to water potential gradient and credit was not given for this term. A significant number of candidates also made reference to 'fluid' or 'substances' moving, rather than to water. The term isotonic would have received credit, but was rarely seen. Some quite good answers did not score full marks because they referred to sperm cells becoming damaged (by the movement of water), but did not qualify this statement. Examiners were looking for the idea of the sperm cells bursting or dehydrating. Some candidates used words such as 'flaccid' or 'crenate', which were considered acceptable, but teachers should encourage such terms to be used specifically.
- (i) Candidates are not expected to learn specific definitions of the terms *gene* and *allele* for this module; however the term gene is introduced in 2857 and allele is part of the higher tier GCSE knowledge. The mark scheme for this question awarded marks across the two explanations which allowed candidates to obtain the marks with good explanations of the term gene. The examiners were however disappointed by the generally poor responses given to this question; many candidates appearing to have a very hazy idea of what these terms mean. The marking scheme allowed credit for very basic statements such as 'a piece of DNA' or 'unit of inheritance', but candidates tended not to mention DNA at all when defining a gene, referring instead to vague phrases such as 'it's what we are made up of' or 'they determine what we are like'. However despite a lack of concrete knowledge a significant number of candidates scored a mark for giving an example of a pair of alleles, such as 'one codes for blue eyes and the other for brown'.
- (ii) Most candidates scored at least one mark here for stating that crossing over would result in genetic variation (in the sperm cells). No credit was given for the word 'variation' if it was not linked to genetics. Better candidates went on to suggest that this gave some sperm an advantage and linked this idea to natural selection. A significant number of candidates thought that this meant some sperm would be deformed and thus not likely to reach the egg.

- (iii) The process and significance of independent assortment is theoretically difficult and this question was targeted at the higher grades. This was one of the most poorly answered of the questions on the examination paper and most candidates failed to score even the relatively straightforward mark for describing what it is. The process was often confused with crossing over with candidates referring to chromatids being separated, rather than chromosomes of homologous pairs. A significant number of incorrect responses described the *order* of bivalents lining up to be random, rather than their alignment. Credit was given where possible for diagrams, but it is essential for candidates to label these as fully as possible in order to obtain the marks. Few candidates pursued what independent assortment achieves in daughter cells with respect to the inheritance of parental genes and a significant number took a step too far in describing zygotes as having a combination of alleles / characteristics, but ignoring the features of the gametes produced by meiosis that facilitate this.

- 2 From the responses to the first parts of this question, it was evident that some candidates had carried out practical tasks to determine RQ values themselves and their responses were excellent. The section of the specification on measuring the efficiency of respiration requires an emphasis on the practical procedures used (learning objectives 5.3.2.(a) and (b)). The A2 textbook covers this section of work well and the Channel 4 Science Bank series contains a video on Respiration, which shows the use of a Douglas bag very clearly.

Confusion between the terms *accuracy* and *reliability* persists and few candidates appeared to understand what happens to RQ values with anaerobic respiration.

- (a) Most candidates scored both the marks available here for describing the equation. A significant minority of candidates explained what the RQ value showed, rather than stating what was meant by the term. As this explanation was given in the question stem, candidates would be expected to realise this could not be the answer required.
- (b)(i) Many candidates correctly suggested some kind of gas probe or analyser. The most commonly seen incorrect answers here were 'spirometer', 'Douglas bag' and 'lime water'.
- (ii) This question earned most candidates full marks and the examiners were delighted by the understanding shown by many, that by calculating averages data becomes more reliable and allows the identification of anomalies. A large number of candidates additionally referred to averages improving the *accuracy* of data, which was rejected by the examiners. Candidates often seem to be confused by the difference between reliability and accuracy and this is an issue worth spending time on when undertaking practical work

- (iii) Many candidates correctly referred to the concentration of oxygen and carbon dioxide in the atmospheric or inspired air in their answer to this question. A few lost marks for only mentioning one of the gases (commonly oxygen) and a significant number incorrectly stated information such as 'age', 'prior exercise', 'tidal volume' and so on.
- (c)(i) Few candidates failed to score one mark out of two for this part of the question, although few of those went on to score the second. Most candidates suggested a mixture of substrates were being respired, or named examples of more than one type of substrate to earn the mark. The second mark was given (rarely) for using the figures to justify their answer.
- (ii) Many candidates correctly stated that the RQ value would increase, but relatively few went on to suggest that the value would rise to 'over 1.0' or to ' ∞ '.
Most candidates then went on to identify correctly the use of anaerobic respiration and the lack of oxygen usage, but then usually contradicted themselves by referring to a resultant *increase* in carbon dioxide production. A small number of candidates earned the AVP available by mentioning that only glycolysis could take place or by giving details of pyruvate acting as a hydrogen acceptor.
- (d)(i) It was anticipated that less able candidates would find this part of the question difficult and this proved to be correct. The majority of answers referred to fats being 'more dense', or having 'bonds which are harder to break and so release more energy when broken'. Very few candidates referred to hydrogen atoms and their role in the production of ATP via the electron transfer chain. Credit was not given for statements that fats have more hydrogen *ions* or hydrogen *bonds*.
- (ii) There were some excellent answers to this part of the question. Many candidates made reference to the need to break proteins down into smaller molecules, although sadly too many responses ended at that point. Better answers went on to explain that amino acids were thus produced, by breaking peptide bonds and that the amino acids could then be processed and fed into the link reaction or Krebs cycle. Worrying, a significant number of candidates think proteins can be broken down in to glucose.

- 3** This was the most mark yielding question on the paper for most candidates and many scored the maximum available.
- (a)** Most candidates scored well on this part of the question, with many making more points than could be credited. There was evidence of thorough coverage of this area of the specification by many centres and candidates had clearly engaged with the material being taught. Candidates did not always differentiate clearly between the therapeutic and recreational effects of cannabis use, but this was not penalised. Weaker responses tended to focus more upon the recreational uses of the drug and gave details about how the drug was taken, or recipes for cooking with cannabis at the expense of issues such as the side effects. As the causal link between cannabis and schizophrenia is yet to be firmly established, comments such as 'cannabis causes schizophrenia' were not credited. Candidates lost marks for unqualified statements such as 'cannabis affects the immune system' and for assertions such as 'cannabis causes physical *and* psychological addiction'. Many candidates cited the use of cannabis for easing the symptoms of arthritis; this was not given credit unless *rheumatoid* arthritis was specified. Few candidates mentioned the therapeutic use of cannabis in increasing appetite in AIDS patients. The mark available for the quality of written communication was frequently awarded, but candidates should be aware that punctuation and grammar as well as spelling are examined in this context; it was not unusual to read half a page of writing devoid of punctuation and the use of 'text message' abbreviations are inappropriate.
- (b)** Again, many candidates scored the maximum marks available. The two most straightforward marks were for suggesting an increase in recreational use and availability of the drug with its change in classification. Many candidates went on to suggest that use of 'harder' drugs may result from the increased use of cannabis, or that younger age groups may be exposed to the drug.
- 4** This was generally an accessible question for most candidates. Marks were lost for imprecision in answers rather than lack of knowledge or understanding.
- (a)(i)** The majority of candidates scored one mark on this section of the question for recognising that an increase in the intensity of light would result in an increase in the rate of photosynthesis and some of these went on to suggest that longer daylight hours would have the same effect. Few candidates went on to suggest that warmer temperatures in tropical climates would lead to enzymes working faster and a large number suggested that the higher humidity would have a beneficial effect on photosynthetic rates. A significant number of responses proposed the idea that there would be higher concentrations of carbon dioxide in the air in tropical climates, which would lead to an increase in photosynthesis rates.

- (ii) Very few candidates scored a mark here for stating that producers convert light energy into chemical / potential energy. Credit was given if answers gave examples of the compounds produced by plant in which the chemical energy was stored. The vast majority of responses mentioned energy without any qualification as to its origin or type. Examiners did not penalise candidates who wrote about organisms 'making energy', but this erroneous expression is not expected at A2 level.
- (b)(i) Most candidates correctly calculate the answer here as 5%. Of those who gave incorrect responses, the majority had attempted to calculate a percentage increase.
- (ii) Many candidates scored full marks for this part of the question. Credit was not given for vague statements such as 'energy loss due to movement, heat loss, metabolic reactions or waste'. The examiners were looking for specific examples of reaction or processes that required energy input such as active transport, muscle contraction, respiration and so on. Many candidates mentioned the fact that parts of the cow were considered inedible by humans. A significant number of responses confused egestion and excretion, consequentially forfeiting marks.
- (c) Once again, many candidates scored at least one mark here either for describing energy loss at each level or discussing the idea that fewer feeding levels meant less inefficient energy transfers. A small number of candidates went on to explain their ideas and earn further credit, but most responses became sidetracked into a discussion of whether or not plants can provide a balanced diet for humans.
- 5** This question proved difficult for some candidates to access and responses to the extended writing section were sharply divided into either excellent or very poor.
- (a)(i) Few candidates failed to score a mark here for correctly filling in the name of the central nervous system on the right hand side of Fig. 5.1. Many additionally scored the second mark for identifying the somatic nervous system, although a number of candidates simply rewrote the name of a division of the nervous system already labelled on Fig. 5.1.
- (ii) Relatively few candidates scored a mark here for stating that the autonomic nervous system is responsible for controlling the pupil reflex. The most frequent error was for candidates stating one of the branches of the autonomic system (either sympathetic or parasympathetic). These are involved in the pupil reflex, but each only controls one particular aspect.

- (b)(i) Many candidates thought that an immature immune system in the baby was responsible for the development of cataracts from early exposure to the rubella virus. Some candidates correctly suggested that the first three months of pregnancy is when the eyes or lens is developing, but few of these went on to gain further credit for suggesting that damage was more likely to occur during development or referred to dividing cells being more susceptible to such damage. These latter marks are high demand and the examiners were not expecting the majority of candidates to access them.
- (ii) Most candidates scored at least one of the available marks here for suggesting that less light would pass through the lens or for making a relevant comment about the reduction in visual acuity. Many candidates also went on to suggest that the receptor cells in the retina would not be stimulated. A significant number of answers simply repeated the word 'cloudy' from the stem of the question in a description of the baby's vision; the examiners did not consider this worthy of credit.
- (c) The responses to this part of the question tended to be excellent or very poor. There were some very well written accounts using precise scientific terminology and easily scoring the maximum number of available marks.
The most commonly seen response that generally failed to score any marks was one where candidates had written a general account of how action potentials are transmitted along neurones.
Some responses confused the rod and bipolar cells and hyperpolarisation and depolarisation were also substituted for each other in some answers.
- 6** This question was mark yielding for the majority of candidates and the examiners were particularly pleased by the quality of responses on section (c)(i) on the saltatory conduction of action potentials.
Many candidates persist on finding magnification calculations difficult.
- (a)(i) A pleasing number of candidates scored both marks here for correctly identifying the cell surface membrane and nucleus. The electron micrograph shown in Fig. 6.1 shows an unusual view of a myelinated axon, but the fact that so many candidates were not distracted by was testament to the fact that they understood clearly the structural relationship between the Schwann cells and neurone axon.
- (ii) The magnification calculation caused great problems for many candidates. Relatively few appeared to realise that there was no requirement to take measurements from the electron micrograph itself and candidates' understanding of the relationship between cm, mm and μm is patchy. Examiners found it difficult to award 'error carried forward' marks as the majority of candidates' workings were muddled in terms of the layout.

- (b)(i) Nearly all candidates scored at least one or two marks on this part of the question. The 'barrier between internal and external environments' and 'controlling entry of substances' were the most commonly stated examples. The cell membrane's contribution to cell signalling / recognition was also stated by better candidates. A few candidates had failed to read the question correctly and gave answers which were applicable only to the cell surface membranes of neurones. Marks were also lost by candidates whose responses were too vague; 'movement of substances in and out of the cell' was not deemed appropriate for example, nor 'keeping the shape of the cell'.
- (ii) It was rare not to award at least a mark for this section of the question, with candidates usually referring to the effects of the build up of cholesterol in the artery walls, such as 'CHD', 'high blood pressure' and so on. Very few candidates described the relationship between fatty acids and cholesterol and seemed to imply that they were the same thing. Atheroma / atherosclerosis were frequently mentioned, but candidates did not often specify that plaques build up in the *walls* of the arteries, thus forfeiting that mark. A frequent misconception seen by examiners was that 'the fatty acids / cholesterol forms clots which block arteries'.
- (c)(i) There were a large number of really excellent responses seen in answer to this part of the question. Many candidates scored the maximum number of available marks and it was encouraging for the examiners to see such precise use of scientific terms. Candidates had understood clearly the nature of transmission along a myelinated axon and most answers made reference to saltatory conduction between the nodes of Ranvier.
- (ii) The final part of the question generated one mark for the majority of candidates. The most common error seen here was to suggest that the action potentials would *be slower*. Few candidates described ion leakage from the axon or suggested that the nerve impulse may 'short circuit'. The most commonly seen correct suggestion was that of poor coordination or examples of slowed responses such as slurred speech.

2867 - Genetics, Homeostasis and Ageing

General Comments

The entry was as last year, small, but it was very pleasing to note that most of the candidates were very well prepared. Teachers and candidates are to be congratulated on getting to grips with the content and technique for this long paper with such a large synoptic component. Once again the interest and enthusiasm of all concerned with Human Biology is evident in the answers to the questions. Thorough learning was more in evidence thus maximising marks where possible, but there is still a tendency to underestimate the depth of factual information required on three to five mark questions, as well as the QWC questions. All candidates finished the paper and seemed to have the timing well under control.

All questions on the paper proved accessible to the candidates. The questions are carefully graded throughout the ability range, so that an A grade candidate is capable of accessing 80% and an E grade candidate 40% of the marks. Therefore, inevitably there are some questions that only an A grade candidate can answer with a response of sufficient depth to obtain all the available marks.

Candidates continue to find calculations difficult. Common errors include putting the decimal point in the wrong place, failure to follow the instructions in the question regarding the number of significant figures and having little idea of what the relevant calculation is. Where statistical calculations are required, formulae and tables are always given. The statistical calculations required for this specification include χ^2 and the *t*-test. A complete list of mathematical requirements is given on page 89 of the Human Biology Specification.

Teaching tip

Ask the students to research a new topic as homework. Divide the class into groups and give each group a different aspect of the topic. Ask them to flag up where synoptic knowledge is required. In class, each group can give a summary of the information they have discovered and the students can construct a glossary of synoptic knowledge applied to that topic. A glossary of terms is a great help with revision of each topic.

Comments on Individual Questions

- 1 This was an encouraging first question and was high scoring.
 - (a)(i) All candidates were familiar with the definitions and these provided a reassuring start to the paper.

- (b)(i) Most candidates also scored well on this question, but it was clear that marks were scored largely for prior knowledge or the most obvious features of the blood smear.
- (b)(ii) It was surprising that some candidates could not remember the simple genetics involved in the inheritance of sickle cell anaemia; learning outcome 5.4.1.1 (c). The Examiners were not insisting on the terms Hb^A Hb^S as long as codominance was indicated by two different letters in the same case to represent the alleles. The use of I^AI^S was not credited as this indicates a membrane antigen. The words 'gene' and 'allele' were not regarded as synonymous in this context or in any other genetics question.
- (c) The majority of candidates could only produce one reason for a change of frequency.
- (d) The commonest answer given was iron deficiency but a number of candidates thought that this made the erythrocytes smaller when in fact they are larger and less mature. They are also fewer in number. There was some evidence that the word 'environmental' was not understood.

Teaching tip

Students should be encouraged to practise the analysis of both normal and abnormal blood smears including those resulting from the sickle cell allele and possibly environmental causes such as lack of iron or folate in the diet.

- 2 Candidates did not perform as well on this question as the Examiners had hoped.
- (a) The marks gained in this question were largely for the fact that high pressure was needed in the glomerulus. However the word 'ultrafiltration' was essential to score one of the marks and many candidates did not score at all.
- (b)(i) Few candidates scored two marks for this calculation and performance was not synchronised with ability. The majority of candidates focused on the figures needed for the calculation but either tried the expression the wrong way up or forgot to convert the value to cm³ per minute per 100g and therefore got the decimal point in the wrong place.

Teaching tip

Candidates should be encouraged to practise a wide range of calculations. This is a synoptic skill.

- (b)(ii) Candidates easily scored two marks for this question but the Examiners would have liked to see inclusion of exactly why more oxygen is needed by the muscle for a third mark. e.g. to produce more ATP or to remove a waste product such as carbon dioxide.
- (c) For those candidates who had thoroughly learnt this topic the content of this QWC question caused little difficulty. There is, however, ample scope for confusion if the factual knowledge is not carefully committed to memory. Some candidates produced only an outline of the process of selective absorption whereas additional detail would have maximised the score. It was disappointing that a number of candidates could not achieve four technical terms correctly used for the QWC mark.
- 3 This question was the type of socially orientated question at which many human biologists excel.
- (a)(i) The Examiners were pleased to note the accurate definitions of the term 'prevalence'. It is worth noting that learning definitions is a relatively easy way of picking up marks.
- (a)(ii) Candidates demonstrated a sound knowledge of the changes associated with ageing, giving a pleasing degree of detail although in some cases not all the relevant systems were covered.
- (b)(i) Most candidates knew how the dominant and recessive alleles would be inherited but some clearly had difficulty in expressing the information.
- (b)(ii) There were some pleasing explanations of the term 'random genetic disease'. The Examiners were pleased with the depth of knowledge to observe, for example, that whilst such a disease was not inherited it could have occurred well back in a previous generation. No candidate referred to an unstable area of DNA.
- (b)(iii) Some answers were wide of the mark for this question but e.g. the suggestion that ageing reduces fertility was very well thought through as were those answers that suggested, with some sensitivity, that patients with this disease may not wish to bring children into the world.
- (c) Those candidates who observed the trend of the graph and gave illustrative figures with units and using both axes, scored two marks without difficulty. Some candidates observed that it was not like cancer where division was uncontrolled. There were also pleasing references to the effect of telomere shortening.

- 4** This was a straightforward question on a familiar topic.
- (a)** Most candidates had a thorough knowledge of the changes in particular areas of the brain producing the symptoms of Alzheimer's disease. However some candidates did not read the question and simply gave a description of the symptoms which is not what the question was about. It is inevitable that when examining a Module of limited content the same topics approached from different angles, will occur in each examination session. This QWC mark was scored without difficulty.
 - (b)** The candidates did well on this question.
 - (c)(i)** All candidates realised that there would be more neurones respiring thus increasing glucose up take. However only a few extended their answers beyond that and referred to more synaptic connections or action potentials.
 - (c)(ii)** Again, all candidates realised that the sample was too small but few extended the answer to score the second mark by e.g. mentioning the lack of a control or controlling any variables. A pleasing answer was that the patients may not have had Alzheimer's disease as it cannot be diagnosed for sure until after death. References to side effects were not credited as the question was about reliability.
 - (c)(iii)** The candidates produced good, sensible answers to this question although ethical points were a little vague and not well expressed.
- 5** Candidates found parts of this question very difficult.
- (a)** Very few candidates realised that increasing the volume of the blood effectively reduces the oxygen concentration per unit volume. The Examiners were not looking for sophisticated language but simply that EPO was triggered for that reason.
 - (b)(i)** Most candidates found this question easy but some got the receptor and effector the wrong way round. A mark for error carried forward (ecf) was credited wherever possible.
 - (b)(ii)** A generic definition of negative feedback would have been acceptable but most candidates used the example given and scored two marks. Candidates find this definition difficult to express in specific terms. Many did not go on to mention the norm or set point or the fact that the actual oxygen concentration varies within narrow limits or 'oscillates' around the set point.
 - (c)(i)** Most candidates scored a mark for observing that there was more oxygen for respiration. Answers such as 'the lactate threshold is delayed' or 'ATP is increased for muscle contraction', were pleasing.

- (c)(ii) Candidates had a sound knowledge of how RhEPO is genetically engineered.
 - (c)(iii) The potentially harmful effects of injecting RhEPO were well understood and there was a wide variety of accurate answers.
 - (d)(i) There was a disappointing lack of wider thought to provide answers to this question. The commonest answer was to refer to the effect of altitude with some reference to blood doping, but few candidates scored three marks. Candidates did not realise that any condition that reduces oxygen concentration has the potential to increase red blood cell count via EPO production. For example, smoking, anaemia, and lung disease.
 - (d)(ii) It was clear that some candidates could not recall the method of calculating degrees of freedom for the *t*-test and many could not read off the probability or express the conclusion. Regardless of the degrees of freedom chosen by the candidate, the probability value was less than 0.05 and more than 0.01. Marks were also awarded to those candidates who simply stated 0.05 as a significant value. Marks could also have been gained by referring to the fact that the difference in red blood cell count was not likely to be due to chance or by use of the term confidence level. Performance on this question was disappointing as statistics are part of the mathematical requirements for this specification.
 - (iii) and
- 6** Lack of detail in the answers to some of these questions lost marks in some cases.
- (a)(i) Most candidates scored maximum marks for this question.
 - (a)(ii) Candidates had no difficulty outlining the symptoms of hypothermia but explanations lacked detail. The Examiners had hoped that candidates would refer to the reduction in kinetic energy and its effect on enzyme controlled reactions. Answers such as these were in the minority and two was a frequent score.
 - (a)(iii) Candidates who had learnt this topic well had no difficulty in scoring three marks.
 - (b)(i) The majority of candidates did not appreciate that only the core temperature is unaffected by environmental temperature. Consequently they failed to appreciate the importance of the word 'indirectly' in (b) (ii) and assumed that any of the conventional methods were measuring core temperature, in most cases dropping another mark.
 - (ii) and

- (c)(i)** Candidates had no difficulty describing the data, with many accurate descriptions, including figures quoted from both axes and complete with units. Explanations however tended to be confused and lacking in detail. For example, very few candidates explained why more oxygen was needed at low temperatures for ATP production, and therefore the release of thermal energy, or that this was a homeostatic mechanism.
- (c)(ii)** Candidates clearly understood how to measure oxygen consumption but did not include enough information to do the experiment. For example, there were very few references to measuring known volumes.

7 This question required candidates to apply their knowledge of prostate cancer.

- (a)(i)** A surprising number of candidates failed to score all three marks for this question. The wide range of answers indicated that they were thinking along the correct lines but they did not register the mark allocation and count facts in order to score enough marks.
- (a)(ii)** The answers to this question were varied and accurate in most cases.
- (b)(i) and (ii)** The majority of candidates deduced that 5-alpha reductase was an enzyme and therefore accessed the synoptic marks in (b) (ii) without difficulty. Error carried forward (ecf) marks were awarded where possible to those candidates who thought 5-alpha reductase was a hormone.
- (b)(iii)** Candidates found this question more difficult as they had difficulty accessing the synoptic marks on the function of ICSH (LH).
- (c)** Few candidates provided enough detail on the diagnostic tests for prostate cancer to access full marks for this question. Useful examination technique is to note the number of marks for a question and count the number of facts given in the answer.

**Advanced GCE Human Biology (3886 / 7886)
January 2007 Assessment Series**

Unit Threshold Marks

| Unit | | Maximum Mark | a | b | c | d | e | u | entry |
|--------------|-----|--------------|----|----|----|----|----|---|-------|
| 2856 | Raw | 60 | 49 | 44 | 39 | 34 | 30 | 0 | 1760 |
| | UMS | 90 | 72 | 63 | 54 | 45 | 36 | 0 | |
| 2857 | Raw | 60 | 52 | 47 | 42 | 37 | 32 | 0 | 331 |
| | UMS | 90 | 72 | 63 | 54 | 45 | 36 | 0 | |
| 2858B | Raw | 120 | 96 | 84 | 72 | 61 | 50 | 0 | 78 |
| | UMS | 120 | 96 | 84 | 72 | 60 | 48 | 0 | |
| 2866 | Raw | 90 | 60 | 51 | 42 | 33 | 25 | 0 | 748 |
| | UMS | 90 | 72 | 63 | 54 | 45 | 36 | 0 | |
| 2867 | Raw | 120 | 87 | 77 | 67 | 57 | 47 | 0 | 12 |
| | 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 | 0.0 | 8.7 | 26.1 | 52.2 | 91.3 | 100.0 | 25 |
| 7886 | 0.0 | 33.3 | 66.7 | 83.3 | 100.0 | 100.0 | 7 |

3886

25 candidates aggregated this series

7886

7 candidates aggregated this series

For a description of how UMS marks are calculated see;
http://www.ocr.org.uk/exam_system/understand_ums.html

Statistics are correct at the time of publication

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