

Human Biology

Advanced GCE A2 H423

Advanced Subsidiary GCE AS H023

Reports on the Units

January 2010

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

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Advanced GCE Human Biology (H423)

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REPORTS ON THE UNITS

Unit/Content	Page
Chief Examiner Report	1
F221 Molecules, Blood and Gas Exchange	4
F222 Growth, Development and Disease	9
F224 Energy, Reproduction and Populations	12
Grade Thresholds	15

Chief Examiner Report

Chief Examiner's Comments

In January sessions, only the written papers are offered. On this occasion, this meant that candidates were able to sit F224 for the first time and both AS units were also available. Again there was a significant increase in entries for A2 with almost 1400 candidates entering for the exam compared with an entry of 876 candidates for the equivalent session on the legacy specification. The increase in entries seen in last year was maintained on F221. F222 was a low entry compared to June and composed almost entirely of re-sit candidates.

The quality of work seen by examiners varied between the AS papers. On F221 and F222, candidates at the 'e' grade end of the cohort appeared to be performing less well, although the standard was good in the 'a/b' range with a distinct improvement in performance for candidates taking F222. No reports were received regarding access to the pre-release material which was available to download and distribute (from Interchange and the public website) from November 17th 2009. It was not always clear that candidates had spent time researching the material – as re-sit candidates, many appeared to have been left to their own devices.

Understanding and answering the questions

This series, analysis of the performance of question papers has generated some surprises concerning candidates' understanding of terms and definitions, which are clearly signposted in the specification. On F221, basic definitions of a double circulatory system and a closed circulatory system elicited correct responses from only 21% of candidates, on F222 only around 25% of candidates could distinguish between a heart attack and cardiac arrest and on F224 fewer than 15% of candidates could explain how GIFT and ICSI worked. This issue was raised in the Chief examiners report in June where it was suggested that terms in the specification should be regularly reviewed via 'starters' and 'quick tests'.

On each paper, a large proportion of the questions are designed to test AO2 assessment objectives – where explanations are required or principles are being applied in a new context. It was clear that, as in previous sessions, many candidates did not pick up on the action words in the stem of the questions and opted for the easier, descriptive approach. Some questions in this session provided descriptions and then asked for the explanation. Candidates found this very difficult as seen from question 5(a) on F221 and 6(b) on F222. Centres should take care that, in questioning students during lessons, some higher order questioning is carried out e.g. 'why' and 'how' questions rather than 'what' questions would develop the skills required for questions aimed at AO2.

Learning outcomes which cover biochemistry are context based in AS Human Biology. It was clear in F224 that the **principles** being taught in F221 are not being carried forward. F224 has approximately one fifth synoptic marks, which can include F221 and F222, and F225 will have one fifth synoptic marks, which can include synoptic questions from F221, F222 and F224. Topics such as respiration and photosynthesis lend themselves to a review of carbohydrate and protein structure and enzyme function in a new context – it is disappointing when an A2 candidate attempts to explain the higher energy density of fats in terms of their glycosidic bonds.

Information, Figures, Tables and Graphs

Assessment objective AO3 requires data analysis and evaluation e.g. implications and relationships from data and practical experiments. These are skills which are also tested in the practical tasks and the same standard of response is expected on the written papers. Candidates are expected to understand terms such as 'valid', 'reliable' and 'accurate' and use them appropriately in answers. Data based questions need careful reading. In F221, question (2b), too many candidates lost marks for responding in terms of pulse rate rather than heart rate. On F222, too many candidates failed to quote the data correctly for death rates (400 rather than 400 per 100 000). Where descriptions from tables and graphs are required, a data quote to support the description will gain marks as long as data is quoted correctly. Ensure that a description rather than an explanation is required (see F221 (Q2) and F224 (4a)).

Teaching Tip

'Thinking Hats' is a good plenary activity. Split the class into small groups and issue each group with a 'Hat' – these can be 'describe' 'compare' 'explain' 'predict' etc. Then display a graph or a table of data. Groups respond according to their 'hat' – and listen out to make sure another group is not using the wrong hat!

The use of plant cell images to assess cell ultrastructure was not well received by candidates. As eukaryotic cells, it would benefit candidates to appreciate how many common organelles there are and the role of plants as producers and the adaptations of plant cells which allow them to photosynthesise would be a good topic for synoptic teaching on F224.

Mathematical Requirements

The examiners noted that most candidates seemed to have access to calculators in this session and there were fewer incidences of the sum not being calculated out. However, candidates still struggle to convert measurements from scale bars into real sizes or magnifications. Many wrote out 'the triangle' formula for converting object size, image size and magnification but then failed to use it successfully. Candidates do need to be encouraged to 'estimate' what a realistic answer could be. For example, on F222 (Q1), years of life lost due to smoking was given as 180 years by one candidate.

Presentation

Again, examiners commented on the inability of candidates to express their meaning clearly and succinctly when answering some questions. On F222, candidates frequently extended their answers outside the lines provided. All written answers are marked but unless handwriting is unusually large, writing beyond the lines is generally a sign that candidates have not taken time to structure their response to the question being asked. In future sessions, additional answer lines will be provided at the back of the examination paper (depending upon pagination) but the allocation of space to a question is usually generous.

Candidates did not express themselves well when describing the role of hydrogen bonds in DNA (F222, Q3) or when trying to describe non-disjunction (F222, Q6) and here the use of well labelled diagrams could have assisted in making the explanation clear.

Practical Assessment

Candidates cannot be entered for moderation for units F223 and F226 in January. Centres are reminded that, as a free standing unit, candidates can re-submit up to two Tasks for F223 as long as they have been re-marked according to the mark schemes within the zip files on Interchange. The guidance for doing so is available on OCR Interchange within the Frequently Asked Questions (FAQ's). Centres are advised to read this carefully.

Report on the Units taken in January 2010

INSET

OCR has a full programme of training events and further information can be obtained from the OCR website at: <http://viewer.zmags.com/publication/0e50e32c#/0e50e32c/1>

F221 Molecules, Blood and Gas Exchange

General Comments

The question paper for this session required candidates to demonstrate their knowledge of cell ultrastructure, the circulatory system, gas exchange surfaces, enzyme structure and phospholipids. Examiners were encouraged by the ability of candidates to apply their knowledge to questions requiring explanations, but it was disappointing that questions requiring definitions or straight recall from the specification were not answered as well as expected.

Candidates should be encouraged to study the specification in detail, paying particular attention to key terms and definitions.

Comments on Individual Questions

Question 1

Candidates were required to recall knowledge of plant and animal cells and be able to identify ultrastructures from an electron micrograph. The question also included a calculation. Many candidates were able to achieve marks for naming at least two of the organelles in part (b)(i) and by correctly identifying **D** as a mitochondrion, were able to gain credit for stating its function. It was encouraging to note that the majority of candidates were familiar with the plant cell ultrastructure.

- Q1 (a)** The majority of candidates achieved the marking point for stating that a eukaryotic cell has a nucleus. A common error was to state that a eukaryotic cell has 'organelles', which failed to gain credit. Candidates had to imply that the organelles were 'membrane bound'.
- (b)(i)** A large number of candidates correctly identified '**A**' as the nucleus, although some incorrectly stated that it was the 'nuclear membrane' which failed to gain credit. '**B**' and '**C**' were less often identified correctly with a number of candidates confusing '**B**' with the 'nucleus' and '**C**' with the 'cytoplasm'.

Teaching Tip

Candidates should be encouraged to study micrographs of varying magnifications and label cell organelles and structures.

- (b)(ii)** Candidates gained marks for correctly stating the function of **D** (mitochondrion) and **F** (chloroplast). Few candidates gained credit for **E**, with the majority stating that it was 'to control what enters/exits the cell'. This suggested that candidates had confused the cell wall with the cell membrane. Some candidates failed to gain credit in this part of the question for referring to 'energy being produced' in **D**. Statements referring to production of energy will not be credited at this level.

It was also noted that some candidates were writing more than one answer (either in brackets or following a solidus). In this situation, examiners will only credit the first answer in each case, ignoring further responses in brackets or following a solidus. Centres are encouraged to ensure that candidates are aware of the importance of offering the appropriate number of responses in such cases.

- (c)** Generally well answered with the majority of candidates getting both marks.

Question 2

Generally, the majority of candidates scored well on this question.

- Q2 (a)** Candidates generally gained maximum marks on this question. Common errors which failed to gain credit included reference to veins rather than arteries and inappropriate counting period. It was pleasing to see that a number of candidates gained credit for stating that you should not use the thumb.
- (b)(i)** Candidates were required to use the data provided to describe the effect of the period of exercise on heart rate. Candidates referring to 'pulse rate' did not receive credit as the question specifically asked for effect on 'heart rate'. As candidates needed to use the data provided, examiners were expecting answers that made more than a simple reference to exercise increasing heart rate, but instead made use of the data from throughout the experiment to give the idea that as the exercise period progressed, then the heart rate also increased. The majority of candidates got the first marking point with some of the better responses quoting figures from the table to achieve two marks.
- (b)(ii)** Candidates were asked to explain why the heart rate would need to increase during exercise. Examiners were predominantly looking for comparative answers to explain this increase. Therefore responses referring to 'muscles contracting' or 'oxygen is needed' did not gain credit. Examiners were also looking for the fact the blood flow increases in order to supply muscle cells with more oxygen (supplying the cells with oxygen faster does not necessarily imply that the total amount of oxygen supplied to cells increases).
- (c)(i)** The majority of candidates mentioned two health considerations here and no mention of safety, and therefore few candidates achieved two marks for this part of the question.
- (c)(ii)** Examiners were pleased to see a large number of candidates referring to reliability in their responses. However, some candidates still confuse the terms 'reliability' and 'accuracy'.

Question 3

Generally, candidates did not score highly with this question and there were few responses worthy of credit for part (b)(iii).

- (a)(i)** Many candidates achieved the first marking point for the 'double circulation', but some candidates failed to gain credit as they referred to there being two 'systems' instead of circuits without further clarification. However, candidates who further qualified their response with reference to 'systemic' and 'pulmonary' systems were credited.

When explaining the term 'closed circulatory system, many just stated that the blood stays in the system, which did not gain credit.

- (a)(ii)** Generally not well answered. Candidates needed to understand what a double circulatory system is (from 3)(a)(i) in order to give good quality answers to this question. Correct answers most frequently made reference to oxygenated and deoxygenated blood not mixing or to (high) blood pressure being maintained. There were a number of vague references to blood being pumped by the heart to different sites or there being separated routes through the heart with little further qualification. Such responses were not considered worthy of credit.

- (a)(iii)** This part of the question was poorly answered with many candidates failing to make the link to diffusion. Responses needed to make the link between the need for a circulatory system and the vital substances it carries against potential alternatives for oxygen/glucose delivery in the absence of a circulatory system. Weak responses discussed the idea of the blood circulating to all cells, suggesting that the blood would pool and not move against gravity without a circulatory system. Good responses saw candidates referring to simple diffusion of oxygen/glucose across the surface to cells, in particular with reference to the length of the diffusion pathway to cells deep within the body. Some candidates went on to describe that large organisms in turn cannot rely on simple diffusion because, with a high number of cells, they also have a high demand for oxygen and glucose. Unfortunately, a number of candidates that referred to the SA:V incorrectly stated that humans have a large SA:V ratio because 'we are big'.
- (b)(i)** Many candidates correctly identified vena cava, although a common error was to identify vein **P** as the pulmonary vein.
- (b)(ii)** Many candidates were credited with correct responses. The most common incorrect answers referred to epithelium, elastic fibres and cell walls.
- (b)(iii)** For this part of the question, examiners were looking for a *explanation* of a particular feature of the vein's structure that was correctly linked to its function, so description alone of the vein's features was not sufficient to gain credit. The most common correct answer seen referred to the fact that 'veins have valves in order to prevent the backflow of blood'. Many candidates described the relatively large lumen of veins, but many claimed this was to maintain or reduce the pressure in the veins, which implied that the blood was at high pressure upon entering the vein. Instead, examiners wanted to see that the vein only needs a wide lumen and thin walls because the blood is at a low pressure already. Similarly, many candidates stated that the wide lumen allowed for a large volume of blood to flow through the vein, but examiners were more specifically looking for the vein being able to carry the same volume as the arteries in order to match delivery of blood returning to the heart with output. A relatively small number of candidates described smooth endothelium reducing friction; examiners did not credit responses which did not include reference to the endothelium being 'smooth'.

Question 4

Overall, the majority of candidates produced responses which showed knowledge of enzymes and protein structure. It was encouraging to see some candidates achieving full marks.

- Q4 (a)(i)** Generally a well answered question. It was pleasing to see many candidates achieving the QWC mark for correctly stating the names of the bonds or interactions present in tertiary structure. The most common answer credited by examiners referred to a globular protein being a 3D structure with hydrogen, ionic and disulfide bonds, which gave three marks provided the technical terms were spelt and used correctly. Few candidates described that the named bonds occur specifically between the variable R-groups of individual amino acids, and fewer still made reference to how hydrophilic and hydrophobic R-groups are situated within the protein structure to contribute to its final shape. It should be noted that marking points were only awarded for responses specifically relevant to describing the tertiary structure, and descriptions of secondary structure e.g. alpha-helices and beta-pleated sheets, were not credited. Credit was not given for responses that confused tertiary and quaternary structures by suggesting multiple chains of amino acids folding and coiling up together, although candidates were only penalised

once for this mistake.

- (a)(ii) Generally well answered by candidates who were able to apply the knowledge of enzyme structure and function to a named enzyme, in this case, thrombin.
- (b) The majority of candidates recognised that the clotting time increased and that less fibrin would be produced, however very few candidates extended their explanations which resulted in many candidates only achieving two marks for this part of the question.

Question 5

Candidates failed to score highly on part (a) of this question and overall there were a considerable number of misconceptions regarding lung structure and the role of elastic fibres. The question was a clear case of emphasising the need for candidates to read and understand the question being asked in the paper.

- Q5**
- (a) Candidates were asked to describe features within the lung that enabled an efficient gas exchange surface, however a large number of candidates instead described why the lung needed the features outlined, and so did not gain credit. A number of candidates were able to pick up low marks, most commonly for describing large numbers of alveoli increasing the surface area, or for the lungs inhaling a high concentration of oxygen, or alternatively the blood entering the lungs having a high concentration of carbon dioxide, but few candidates achieved further marking points. For some marking points, examiners required a higher level of detail in the candidate's responses, for example, many candidates made reference to squamous epithelium in the alveoli, or to the alveoli only being one cell thick, but examiners were looking for more specific locations in the alveoli wall or lining to clearly define the structure. There were many incorrect references to 'mucus' and 'surfactant' and few candidates were credited for responses aimed at describing how the lungs were protected from drying out.
 - (b)(i) Generally well answered.
 - (b)(ii) Overall, there were some good responses for this part of the question. Candidates who failed to gain credit had not clarified the stretch and recoil, with 'inhalation' and 'forcing air out' or had used the terms 'expand' and 'contract' with reference to the fibres.

Question 6

The majority of candidates demonstrated knowledge of phospholipid structure to gain some credit. However, attention to detail was lacking in some cases.

- (a)(i) Despite a few incorrect references to glycosidic and peptide bonds, it was pleasing to see the majority of candidates correctly using the term 'ester' bond.
- (a)(ii) Many candidates gained credit for stating that it was a 'condensation reaction', but few could correctly link this to glycerol and fatty acids or mention that it was between OH and COOH groups. Glycerol was commonly mistaken for something else e.g. glycogen. Candidates who recognised the link between glycerol and fatty acids were then credited with QWC mark. The result was that examiners were either awarding one or three marks.

Report on the Units taken in January 2010

- (b)(i)** Generally well answered by candidates who could recall the difference in structure between phospholipids and triglycerides. It should be noted that where responses require two answers and given appropriate line spacing then candidates should be encouraged to use them accordingly.
- (b)(ii)** Many candidates achieved one mark for stating that it formed a bilayer. However, the mark scheme required candidates to refer to the 'phosphate' being hydrophilic and the 'fatty acid' being hydrophobic, rather than simply refer to 'head' and 'tails', which resulted in some candidates failing to gain credit for marking points two and three.

F222 Growth, Development and Disease

General Comments

The examiners were pleased with the responses to Questions 1 and 2 which were based on the pre-release material. It is assumed by the examiners that Centres prepare their candidates and that topics introduced in the Case Studies are 'unpicked' by students and unfamiliar terms researched. However, it was clear that some candidates were much better prepared than others. This was particularly clear on the question on prospective studies which will be discussed in more detail in the appropriate section below.

This was the second paper to test the new F222 specification and it was pleasing to see evidence that many candidates were well grounded in complex new topics such as control of the cell cycle. However, the examiners were disappointed in the poor responses to questions on vaccination, particularly on the sequence of childhood vaccinations. One possibility was that Centres assumed that this material would be familiar and left students to research this on their own. Unfortunately, although many candidates were aware that measles, mumps and rubella were vaccinated against, the timing of these and the other vaccinations seemed to pure guesswork for too many candidates.

Generally speaking, there were several questions where a failure to read the stem of the question resulted in marks being missed needlessly. This was particularly obvious in Question 1(a) and 1(e). There was no evidence that candidates were short of time. The number of poor or 'no responses' to the final question was related to the material being tested rather than the time available.

Centres should note that, on Questions such as 4(a) which required 'ticks' and 'crosses', 'hybrid' ticks (a tick crossed through) are not credited and candidates should be discouraged from using these.

Comments on Individual Questions

- Q1**
- (a)** Candidates were asked to use the examples from the Case Study to illustrate mortality rates, an infectious disease and a non-infectious disease. The commonest mistakes were to offer definitions of these terms rather than an example, or to omit a reference to the sample size, '1 million deaths' rather than '1 million deaths in 14 million people'. Less than 50% of candidates scored both marks on 1(a).
 - (b)** While some candidates had clearly 'researched' the term 'prospective'; many referred to a 'long term study' without indicating how the study would be undertaken (questioning/monitoring) and that the population would be monitored over a long period of time. The idea of a 'forward looking' study needed to be implied – 'long term' could reflect the time it takes to analyse large amounts of data.
 - (c)** The Question referred to the initial study designed by Hill and Doll and too many candidates either referred to the follow-up studies or to precautions for which no information was given in the Case Study and which could only have been 'presumed'. The examiners received the impression that those who scored well on this question had done their preparation well as the correlation between high performance on this paper and on the rest of the paper was not a strong one.
 - (d)** The graph questions required careful reading and the application of some common sense. The calculation was relative simple once candidates realised that it was the number of deaths which was required but less than 50% of candidates obtained

both marks. The examiners were puzzled by answers to part (ii) which suggested that 180 years of life was lost but overall the response to this question was good with over 80% of candidates obtaining the mark.

- (e) Several candidates tried to explain the changes in death rates rather than describing the pattern on the graphs. The examiners also noted a tendency for candidates to try and express a rate (e.g. 400 deaths per 100 000) as a total number (400 000 deaths). The idea that lung cancer would take time to develop was only well explained by more able candidates but most candidates were able to describe some symptoms.

- Q2** (a) As in previous human biology papers, the link between infectious diseases and pathogens is still not obvious to some students with less than 50% of candidates scoring both marks. In (b), it was pleasing to see how often the idea of a 'control' was either referred to or described but surprisingly few candidates were able to spot that both were members of the 'allium' genus in part (c). While this word was not required, the examiners were looking for the idea that the plants were closely related. Very few answers referred to common DNA regions or genes. Not surprisingly, this meant that few could explain the advantages of using DNA markers. Responses to (d)(i) were surprisingly poor. Both terms are clearly stated in the learning outcomes and the topic was signposted in the pre-release material but too many candidates either confused the two terms or failed to describe a heart attack in terms of damage to the coronary artery or a failure to supply oxygen to cardiac muscle. The extended writing was done well. The hardest mark proved to be the QWC with less than 15% of candidates stating that the patient would need to be monitored during the procedure.

Teaching Tip

Several candidates used the acronym 'DR. ABC' (Doctor ABC); D - check for DANGER, R - are they RESPONSIVE, A - check or clear AIRWAYS, B are they BREATHING, C - commence CPR. Note that it is BREATHING that is checked initially rather than pulse - a pulse can be too difficult to find and compressions are given in the CENTRE of the chest - again, counting ribs to locate a position would take too much time.

Question 3

Biochemistry questions prove to be difficult for many candidates and it was detailed knowledge that was lacking on this question. The phosphate group was identified by most candidates on (a) but fewer than 30% of candidates recognised deoxyribose with most just stating 'pentose'. In 3 (b)(i), many candidates confused purines and pyrimidines or failed to appreciate that, as adenine was 30%, then thymine would also need to be 30%. While most candidates can state the base pairing 'rules' and did so in (b)(ii), only around 30% of candidates could actually use them. The role of hydrogen bonds was not well explained. A common misconception is that they are formed by condensation reactions. Statements such as 'they hold bases together' did not score unless it was clear that the candidates was referring to strands and this term was rarely used. In part (c), the commonest mistake in (c)(ii) was to suggest that the DNA was single stranded in bacteria but the examiners were pleased at the response to part (d) with 25% of candidates correctly spotting that an RNA virus such as HIV would not show the base pairs.

Question 4

- Q4 (a)** Part (a) proved to be a good discriminator with only high scoring candidates scoring 4 or 5 marks. Centres should note that, on long papers such as F222 and F225, candidates cannot be expected to answer exclusively in continuous prose and so question formats such as tick boxes and gap fills will be appearing.

Teaching Tip

Tick boxes to interrogate similarities and differences are good starters or plenaries and several 'pairs' lend themselves well to this treatment. Examples could be lymphocytes and neutrophils, Type 1 and Type 2 diabetes, DNA and RNA, photosynthesis and respiration, prokaryotic and eukaryotic cells.

- (b)** This question was well answered by most candidates but in part (c), many candidates mis-read the question which asked for a 'route' rather than a mechanism for entry into the nucleus. The 'ase' suffix indicates an enzyme – surprisingly few candidates spotted this. Again, in a context base specification such as Human Biology, although enzymes are covered in the learning outcomes on blood clotting, it is expected that the principles and key ideas be made clear to students such that they can apply these to 'novel contexts' such as cyclin kinase in a question which tested AO2 assessment objectives. The examiners were pleased at the responses to part (e) – this is a new topic and many candidates were clearly well grounded in elements of cell cycle control. The most frequent mistake made by even the better candidates was to confuse the P53 gene with P53 protein. Despite this, over one fifth of candidates scored 3 or more marks.

Question 5

This question proved to be the most difficult question on the paper. Less than a quarter of candidates could state that a vaccine contains antigens with most either giving vague answers about protection against disease or describing a type of vaccine. Less than 5% of candidates were aware of the order that childhood vaccinations are given. This would seem to be a learning outcome that has been neglected. Many candidates did not appreciate that a live vaccine is an attenuated strain and very few could state the advantages of using a live vaccine although the disadvantages were better explained. For Question 5(d), less than half of candidates could name the Human Papilloma virus and only one fifth could explain that the absence of a cervix in boys means they are not going to get cervical cancer. There was some confusion as to which type of cancer was being protected against with breast cancer and ovarian cancer being suggested. Question 5(e) was answered well by most candidates.

Question 6

A substantial number of candidates were very confused and used the terms gamete, chromosome and gene as if they were interchangeable. Hence good explanations of non-disjunction leading to Turner's syndrome were seen from fewer than 20% of candidates. Common errors were to write about a sperm or egg having no chromosome or having the sex gene missing. Some candidates offered both XO and XXY as part of their description without making it clear which was Turner's.

In part (b), the steps in preparing a karyotype were provided and this proved to be a more difficult way of testing this learning outcome than asking for the steps to be described. Over one fifth of candidates omitted the first two parts of this question altogether indicating that, as with childhood vaccinations in Q5, possibly more directed teaching is required in this area.

F224 Energy, Reproduction and Populations

General Comments

Generally, the examination paper was considered to be accessible to most candidates and they made good attempts to answer the questions set. There was a problem with a number of scripts regarding poor spelling, not just with technical terms, but also basic English, which limits the candidates' ability to gain marks for points they probably fully understand but cannot express.

Command words are extremely important when answering an exam paper as misinterpretation of them, such as describe or explain, can lose a candidate several marks. Make sure candidates read the command words carefully.

When a question says 'With reference to Fig.' it means that there will almost certainly be marks for quoting data, reading off a graph or describing a diagram etc.

Comments on Individual Questions

Q1 (a) Stages of spermatogenesis need to be spelt correctly because they are very similar to each other. Therefore mis-spellings that were not phonetic were not given credit e.g. spermacyte. Many candidates correctly mentioned primary spermatocyte or spermatogonia for mitosis and secondary spermatocyte or spermatid for meiosis.

(b) Most candidates were able to correctly identify the acrosome.

(c) Candidates related well to the format of this question with enzymes, zona pellucida, flagellum and fuse being frequently and correctly named. A common error was to use oocyte for egg which was not thought to be precise enough and credit was only given for secondary oocyte.

(d) Many were able to name two disadvantages of using the 'morning after pill', the most common being sickness or abdominal pains and the fact that it doesn't protect the woman from sexually transmitted infections. Unfortunately stomach pains were mentioned by several candidates. Stomach should not be used as an alternative for abdomen at A2 level.

Q2 (a) The candidates were presented with a photomicrograph of a sarcomere and it was encouraging to note that the majority were able to correctly identify one area containing only actin and the other both actin and myosin.

(b) Some candidates decided to write about the whole of the sliding-filament theory rather than to confine themselves to the role played by calcium ions as requested and would have wasted valuable time.

However, it was evident that some candidates had thoroughly learnt this sequential process and consequently scored highly.

This question was the first to include a mark for the quality of written communication (QWC). It is important to note that correct spelling is absolutely critical in obtaining this mark.

(c)(i) A very simple calculation was required for this question and sadly many candidates were unable to score any marks. It is worth noting that if data is required to one decimal place, then this should be reflected in the answer.

- (c)(ii)** Candidates were asked to suggest two factors that needed to be taken into account when designing the experiment to measure an increase in biceps muscles. It is worth stressing that if two answers are required then the examiner will mark only the first two answers and not select from a list of three or four. Fortunately many were able to achieve full marks for this question.
- (c)(iii)** The dietary supplement contained an active ingredient and candidates should have suggested an ingredient and described how it may have led to an increase in the circumference of the biceps. Many were able to name protein, steroids or creatine phosphate but were unable to describe how it worked in sufficient detail.
- Q3**
- (a)** Candidates were asked to look at a diagram of an ATP molecule and name the base adenine and the sugar ribose. Whilst many were able to achieve this task, a large minority called the base 'adenosine' and the sugar 'ribulose'.
- (b)** This question consisted of filling in a table to show the products of glycolysis, the Krebs cycle and oxidative phosphorylation. A good proportion of candidates gained full marks, with very few managing to gain no marks at all. Carbon dioxide was a commonly offered wrong answer for oxidative phosphorylation, as was hydrogen ions.
- (c)** This question proved to be more challenging than some of the others and unfortunately many answers were muddled and inaccurate. It was hoped that candidates would mention that lipids contained more hydrogen atoms, or carbon-hydrogen bonds, and this would lead to more reduced NAD and hence more ATP per gram would be formed.
- (d)(i)** The usual equation used to calculate the RQ value was divided into two marks. One mark was awarded for a simple statement that for each substrate respired you need to divide the carbon dioxide produced by the oxygen consumed. An extra mark was given if the word 'volume' was applied to both gases. No credit was given to the use of 'amount' instead of 'volume'. Many achieved one mark with the better candidates scoring both marks.
- (d)(ii)** Despite a lack of precision in the previous question, the majority of candidates were able to state correct RQ values for carbohydrates and lipids and to mention that the RQ value would rise if the respiration became anaerobic.
- & (iii)**
- Q4**
- (a)** Candidates were given a table that showed that as the age of a woman undergoing IVF treatment increased, the percentage of live births per treatment cycle decreased. Candidates were asked to *explain* the trend but unfortunately some went on to *describe* the trend in detail, using figures from the table and scored no marks. Those who did follow the instructions usually noted that as women get older, they were either approaching menopause or that their hormone levels would drop. The consequences of this would lead to less chance of implantation and more risk of a miscarriage. Some candidates made references to 'genetic defects' but were not clear that these were with the oocyte rather than the woman.
- (b)** It was clear that some candidates were unsure as to what GIFT and ICSI were and so proceeded to describe general IVF treatment and scored no marks. Others were able to correctly outline the treatments but it is worth noting that if the treatments were not identified then no marks were awarded. Another important point to mention, in a general sense regarding this part of the specification, is the inappropriate use of egg, ovum or ova. Candidates should be reminded that only oocyte will gain any credit, though if egg, ovum or ova were used they were only penalised the first time in the question.

- Q5** **(a)(i)** Candidates were required to name the main enzyme involved in the Calvin cycle and the majority were able to correctly identify rubisco. Likewise, candidates were able to name ATP as a product of the light-dependent stage that would be needed in the Calvin cycle but only better candidates were able to also name reduced NADP. A common error was to mention reduced NAD.
- & (ii)**
- (b)(i)** In this question, candidates were asked to describe the relationship between mass of algae and concentration of dissolved oxygen shown in a graph. Whilst many were able to describe the relationship, far fewer used correct data from the graph to support their answer. It is worth mentioning here that units are usually required when quoting data.
- (b)(ii)** Candidates were asked to explain the reasons for the increase in the mass of algae in the lake. Correct answers mentioned that ions from the effluent would run into the lake and that algae would use these ions, such as nitrates, to grow. Many correctly mentioned eutrophication.
- (b)** Explanations of the decrease in the dissolved oxygen in the lake were less successful. A good answer would have stated that the plants in the lake would have died due to lack of light caused by the algal bloom. The dead plants would be decomposed by aerobic bacteria which would use up more oxygen. Unfortunately, many mistakenly referred to the extra algae using up more oxygen and preventing other plants from photosynthesising and producing oxygen.
- (iii)**
- Q6** **(a)** This question contained the second QWC mark and required candidates to explain the meaning of an ecosystem. Whilst many obtained their marks for content, the QWC mark was less frequently awarded due to a failure to use proper ecological terminology such as biotic, abiotic, community and biodiversity.
- (b)** Many candidates successfully stated three benefits to human society by conserving tropical rainforests. The most frequent answers were a reference to the discovery of plants with medical properties and ecotourism. Many candidates mentioned the fact that the forests were carbon sinks and would take carbon dioxide out of the atmosphere but failed to score a mark because they did not go on to say that this would reduce the effects of global warming or climate change. Only the first three answers given were marked.

Grade Thresholds

Advanced GCE Human Biology (H423)
 Advanced Subsidiary GCE Human Biology (H023)
 January 2010 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	a	b	c	d	e	u
F221	Raw	60	39	33	28	23	18	0
	UMS	90	72	63	54	45	36	0
F222	Raw	100	65	58	51	44	37	0
	UMS	150	120	105	90	75	60	0
F224	Raw	60	43	37	31	26	21	0
	UMS	90	72	63	54	45	36	0

Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A	B	C	D	E	U
H023	300	240	210	180	150	120	0

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

	A	B	C	D	E	U	Total Number of Candidates
H023	2.2	17.8	42.2	71.9	95.6	100.0	136

136 candidates aggregated this series.

For a description of how UMS marks are calculated see:

<http://www.ocr.org.uk/learners/ums/index.html>

Statistics are correct at the time of publication.

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