RECOGNISING ACHIEVEMENT

GCE

Human Biology

Advanced GCE **A2 H423**

Advanced Subsidiary GCE **AS H023**

OCR Report to Centres

June 2012

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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

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

OCR will not enter into any discussion or correspondence in connection with this report.

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OCR REPORT TO CENTRES

Overview

Chief Examiner's Report

In this session there was evidence that, while E grade candidates were showing an improvement in performance, there were slightly fewer candidates gaining the higher grades. In a context-based specification such as GCE Human Biology, there are areas in AS Units, particularly F221, where, if candidates are not secure in their knowledge, the knock on effect on later units of the specification is profound. One such area is biochemistry. It was clear that even able candidates found this topic challenging on F221 in questions **1(d)** and **1(e)** and question **6(b).** Hence, it was not surprising that, in those questions on the A2 units that required a sound knowledge of biochemistry, such as **3(b)** in F224 and **5(c)** in F225, students were making fundamental errors. The number of AO2 marks on A2 papers means that, where biochemistry is being tested synoptically, it will almost inevitably be tested in a new context. It is essential that the principles of enzyme action and the biological macromolecules are extended beyond the context of blood clotting and blood as the candidates progress from AS to A2.

There are other learning outcomes covered at AS which were 'revisited' as synoptic material in A2. Again, it was clear in F222 question **1(b**) that CT and MRI scans are confused by students and, where this material was touched on in F225 **1(b)(ii),** the confusion persisted. A synoptic approach to A2 teaching is essential and any opportunity to reinforce AS learning outcomes should be incorporated into lesson planning.

Centres are advised to note carefully the comments of the Principal Moderator concerning what is permissible teacher guidance to candidates on practical skills. Where there is evidence that candidates have been 'coached' in the requirements of the mark scheme, this will be investigated as a potential malpractice. Centres should also take careful note of the guidance on the reasons why practical work is sometimes returned to a Centre for remarking.

Understanding and answering the questions

The importance of identifying and implementing the command word in a question has been mentioned in previous reports and Centres are to be congratulated on training their candidates well in this respect. However, the additional time available on A2 papers is not always being put to good effect in terms of interpreting questions. This was particularly apparent in F225. Centres need to stress that the additional time available is 'reading and thinking' time – not necessarily writing time. There was a marked increase in the use of the additional pages by candidates, but too many of them failed to indicate that the answers continued or to number the questions correctly on the additional pages. Failure to read questions carefully was also one of the reasons for disappointing performance on some questions in F222.

Yet again, a common feature across the units was the lack of precision in the candidate's response. Examples can be seen in F221 **Q4(c)**, **Q2(c)(ii),** in F222 and **Q6(c)** in F225.

As in previous sessions, key terms and definitions were tested. Candidates clearly recognise and use terms without necessarily fully understanding what the terms mean. This was particularly noticeable for the terms 'double blind' and 'randomised'. Many candidates can 'trot out' the phrases when these are required in F222 but when asked to 'unpick' their meaning in context in F225, a number of misconceptions were apparent.

Dealing with Data

Candidates are expected to describe patterns from graphs and tables in the written units and, while many successfully do this, marks were lost for poor use of data quotes or for inserting the incorrect unit. While the questions using data on the AS papers were relatively accessible, candidates should be prepared for more challenging uses of data on F224 and F225. It was notable on **Q1** of F224 how few candidates appreciated the significance of a birth **rate** / death **rate** comparison, and on F225 **Q4**, the significance of providing data on mortality due to alcohol in two different formats was overlooked by the vast majority of candidates.

Mathematical Requirement

Questions involving calculations on both **A2** papers were done well although failure to use the correct unit in the answer or to round correctly as requested cost some candidates one mark. Centres are to be congratulated on 'training' candidates in carrying out standard procedures such as the calculation of percentage differences. However, at **AS**, **Q2(c)** on F221 proved very difficult. This type of question has been asked previously using ECG traces and blood pressure traces and this material has clearly been used to train candidates. Unfortunately, some have confused beats per minute and breaths per minute.

As in previous sessions, calculations questions produced a relatively higher number of 'no responses'. Centres need to instill a confident approach by candidates such that they feel they can attempt mathematical problems, as these will continue to appear in question papers and tasks.

F221 Molecules, Blood and Gas Exchange

General Comments

Overall, this paper was well attempted by candidates who appeared able to answer the questions in the time available.

The question paper yielded a good range of marks, and the performance of the cohort produced a relatively normal distribution of marks. Candidates demonstrated a wide range of ability, with stronger candidates displaying their knowledge and gaining high marks. This suggested to examiners that centres were continuing the good work in preparing candidates for the contextual format of questions in this paper and in GCE Human Biology papers as a whole.

There were no obvious misinterpretations of the rubrics and centres should be commended for continuing to stress to their candidates the importance of correctly interpreting the command words such as *describe*, *explain* and *suggest*. As in previous papers, the word '*suggest'* is the usual trigger for candidates to display their wider knowledge of the F221 specification.

Once again, questions that required some knowledge of biochemistry continue to discriminate between candidates. **Q6(b)** was a good example of this, with some less able candidates correctly describing a condensation reaction but then contradicting themselves by describing the formation of an ester bond when the question was about the formation of a disaccharide.

Questions involving enzyme activity also show misconception with some candidates describing the substrate as having the active site.

Candidates are still struggling with simple calculations – as evident in **Q2(c)(i)** which required candidates to read a spirometer trace. Little calculation was actually required on this occasion but few candidates gained either of the two marks available.

Comments on Individual Questions

1 This question was generally well answered by the majority of candidates who demonstrated a basic knowledge of blood components and blood clotting. Part **(d)** saw some misconception surrounding enzyme activity but **(e)** elicited some good responses where candidates were required to apply their knowledge to a situation involving enzyme inhibition.

(a) Generally very well answered, although the majority candidates were awarded this mark for stating that it was a group of cells carrying out a function and not that they were a group of specialised cells.

(b) **(i)** Very well answered by the majority of candidates. Urea was the most common correct answer seen by examiners.

(ii) Generally well answered.

(iii) Generally well answered.

(c) Many candidates did not gain credit for the damaged tissue part of this question. Some candidates stated that chemicals were released by the damaged tissue, not the exposed collagen fibres, and very few candidates stated that thromboplastin was released. Examiners could not award credit to candidates who stated that the damaged tissue became sticky without indicating that platelets were then attracted to it.

The majority of candidates were able to gain marks for stating the role of platelets and fibrin.

(d) Generally well answered. Candidates not achieving maximum marks were often failing to refer to shape in their explanation, despite mentioning that the active site was specific or complementary. Many candidates gained the marking point for **only** fibrinogen being able to fit into the active site of the enzyme. Less able candidates commonly gave the wrong substrate for this enzyme or incorrectly referred to the substrate having an active site.

Teaching tip:
When answering questions on enzymes, candidates should be encouraged to learn key terms with regards to activity of enzymes. Some confusion regarding the position and role of the active site is still evident.

(e) The majority of candidates gained maximum marks for this part of the question. Marking points two and three were awarded most often by examiners. Candidates were expected to be able to use the diagram to suggest how heparin may inactivate thrombin, and some correctly referred to the term competitive inhibition, which was worthy of credit.

2 Overall, this question showed normal distribution with more able candidates gaining marks by demonstrating their knowledge of the use of the spirometer in part **(a).** Less able candidates also gained some marks on this part of the question but were less likely to be able to describe the change in the trace in part **(c)(iii)**. Reading the trace and performing a simple calculation in **(c)(i)** proved challenging for the majority of candidates.

(a) The majority of candidates were able to access at least two marks on this part of the question. However, some candidates referred to a different piece of equipment and did not use the diagram to explain how the illustrated set up was used to measure tidal volume.
Many candidates were able to identify that breathing through the mouth piece would cause the chamber to move but did not correctly link upward movement with breathing out.

(b) Many candidates identified at least one reason that would account for the variety of lung volumes between individuals, often relating the difference to a lung disease such as, asthma. Unfortunately, a significant number of candidates did not read the question properly and repeated that the volume of the thorax and size of lungs affects the volume of gases breathed in and out which had already been stated in the stem of the question.

(c) **(i)** This was not answered well. Unfortunately the majority of candidates were not able to calculate the breathing rate correctly or use the appropriate units. BPM is commonly used to express 'beats per minute' when studying heart rate and so could not be credited for the unit in this case.

(ii) The majority of candidates were able to gain at least two marks for this part of the question, with marking points one and four most commonly seen by examiners. Candidates often misinterpreted the downward trace as breathing out and so missed out on both marking points two and three.

(iii) Candidates mainly gained credit for realising that exercise would increase the breathing rate and correctly related this to the increased frequency of peaks on the trace. Unfortunately, many candidates, whilst attempting to describe increase in amplitude, failed to express themselves clearly enough to be awarded the marking point.

3 The first part of this question examined the ability of candidates to understand membrane structures, which was generally well-answered. The role of proteins within membranes was tested in part **(c)** which the majority of candidates could access, however, many candidates failed to understand the significance of the context in part **(d)**.

(a) It was pleasing to see the majority of candidates recognising that the presence of glycoprotein identified this as the exterior of the cell. Some candidates commented on the orientation of the phospholipid, not realising that this would be the same on both sides of the membrane.

(b) The majority of candidates attained both marks for this part of the question with examiners seeing Golgi apparatus as the most common response.

(c) Examiners were pleased to see many candidates correctly referring to carrier and channel proteins thereby gaining two marking points together with the QWC mark. More able candidates went on to describe facilitated diffusion and active transport as the processes by which substances are transported across cell membranes and gained maximum marks. Intrinsic and extrinsic proteins were commonly referred to by candidates and gained credit as the AVP marking point.

(d) Generally, this part of the question was not well answered and candidates often stated incorrectly that the presence of ions 'thickens' the blood or that the red blood cells would crenate. Very few candidates noted that the ions may not be moved out of the blood or referred to the movement of water by osmosis.

4 This question tested the candidates' knowledge of blood pressure and candidates across the ability range were able to access marks available.

(a) Generally, candidates made good efforts to recall the term sphygmomanometer as the instrument used to measure blood pressure. Examiners recognised the difficulty of the term and credited phonetic spellings where possible and were generous in giving benefit of the doubt to candidates who made good attempts at the spelling where it could not realistically be mistaken for another term.

(b) Many candidates recognised that the blood pressure should be measured at rest as physical activity would increase blood pressure and gained credit for this part of the question. However, some disappointing responses stated that exercise would merely affect blood pressure without stating how, which was not deemed worthy of credit. Some candidates discussed trying to find the resting level, which was not credited as it only repeated the stem of the question. Some candidates also discussed trying to determine a normal level which was not accepted unless it was qualified with being the normal blood pressure for that individual, as the normal range is already known. A few more able candidates made reference to this being a value for comparison or a baseline reading.

(c) This was a difficult question aimed at discriminating between higher level candidates, and it proved useful in that respect as only a minority of candidates were credited on this marking point. Most who attempted the question stated that systolic pressure is the pressure in the heart, rather than a measurement in the arteries, although a small number of good answers made reference to the brachial artery. Similarly, for the second marking point, many candidates determined that it was the atria, or even the heart in general, which contracts which was not credited. This was disappointing given that the cardiac cycle is a key element of this module.

(d) **(i)** and **(ii)** Most candidates recognised that hypertension related to high blood pressure and that severe loss of blood would result in low blood pressure, so it was pleasing to see that candidates in general were not confused. However, actually giving a valid reading from the chart proved surprisingly difficult. Many candidates did not know how to give a blood pressure reading, for example, many failed to use two values (one systolic, one diastolic), or gave the readings the wrong way round and so invalidated any credit that could have been awarded. Also, the question clearly requested candidates to use the chart provided, so it was expected that candidates would provide a reading from this chart, and candidates should recognise this feature when they read it in a question.

5 This question required candidates to demonstrate their knowledge of blood donation and parts **(a)** and **(b)** were generally well answered. However, few candidates were able to apply their knowledge fully to the subsequent questions about blood storage.

(a) Generally well answered with HIV being the most common correct response seen by examiners.

(b) There was a good variety of answers seen by examiners and it was obvious that teachers and candidates had looked this up and there were some interesting answers such as 'if you are **planning on** travelling to a country where West Nile virus is prevalent' (this is actually one of the reasons given on blood.co.uk but it does not explain on the website why you may not be able to give blood if you are just planning on going to one of these countries).

Unfortunately, a few candidates provided an example of a virus, e.g. flu / cold, so lost out on one of the marks. Also, some candidates gave two examples of an illness or medications (only one mark available on the mark scheme for either of these reasons) so were only awarded one of the two marks available.

The most common correct responses seen were anaemia, recently donated blood, pregnancy, recently had a tattoo and had a blood transfusion.

(c) **(i)** The majority of candidates gained one mark for correctly stating a use for packed red cells and all of the marking points were seen by examiners. The most common reason not to award the mark here was if the candidate referred to 'blood loss', without any further qualification.

The candidates found it more difficult to provide a use for the platelets and the majority made incorrect statements referring to using it for someone to help the blood clot (either in someone that does not have clotting factors or someone that has had an accident / surgery). Of the few candidates that did gain credit here, either bone marrow disease or leukaemia were most commonly seen.

(ii) Few correct responses were seen by examiners and even candidates who were able to make the link between the importance of the temperature and the enzymes present in the packed red cells, they usually stated that the enzymes would denature at 20 – 24 ^{o}C. Examiners were looking for responses that gave a comparative statement e.g. enzyme activity would increase rather than simply that enzymes would start to work.

Few candidates took it the step further and stated the effect an increased enzyme activity would have on storing the packed red cells, i.e. that they would have a shorter shelf life.

Unfortunately, some candidates still incorrectly refer to **cells** becoming denatured at higher temperatures.

(iii) Most candidates gained at least one of the marks here for stating the date it was taken. It was pleasing for examiners to see a number of candidates referring to the Rhesus factor, although some candidates gave statements such as 'whether they are positive or negative', without referring to the Rhesus factor which was not worthy of credit.

6 In this question, the biochemistry of carbohydrates was being tested with straightforward recall of the role of carbohydrates and formation of a disaccharide being required. The sentence completion task in part **(c)** was a welcoming end to the question paper and it was pleasing to see the majority of candidates gaining marks here.

(a) Candidates were able to gain two marks for naming a carbohydrate and then correctly stating the role. It was therefore disappointing for examiners to see responses which did not include a named carbohydrate such as glucose or glycogen and therefore failing to gain any marks for this part of the question.

Some candidates referred to starch which could not be credited as the question was about the role of carbohydrates in the human body.

(b) The majority of candidates were able to access this part of the question with many gaining at least two marks and achieving the QWC mark for two terms. Some less able candidates appeared able to access the biochemistry and recognised the fact that a condensation reaction was needed, but then often went on to describe the formation of a triglyceride or polypeptide.

(c) This part of the question was generally well answered, although some candidates failed to gain marks for marking points two and three due to the incorrect order.

F222 Growth, Development and Disease

General Comments

The overall performance of the cohort suggests that candidates found this paper challenging. The more able candidates were able to display their knowledge and attained high marks across a wide range of topics. The less able candidates showed areas of relative weakness; yet on a few questions their knowledge was good, for example in questions **1(c), 1(e)(ii), 3(a)(i) and 4(b)**.

It was pleasing to note that candidates had obviously studied the pre-release material and were able to use the information to produce some good answers to questions **1** and **2**. Overall, there was also an improvement in the interpretation of questions. Only some of the less able candidates misread questions and as a consequence failed to gain marks, for example **3(b)** and **5(c).**

Many candidates were not confident in answering 'suggest' style questions and often just re-stated the information in the stem of the question, for example **3(b)(ii)** and **4(a)(ii)**. As in past examination sessions, marks were also lost as a result of poor examination technique. For example, failing to use the correct scientific terms, and not including sufficient detail in their answers to access all of the marks.

Comments on Individual Questions

1 This question was based on the case study '**Screening for Lung Cancer' (Case Study 1).** This question was designed to be an accessible start to the exam.

(a) **(i)** Many candidates gained one mark for correctly stating that screening detects the presence of a disease before symptoms appear. Only a few candidates went on to say that screening tests a large population or a group at risk from the disease and gained two marks.

(ii) Only the most able candidates gained two marks for distinguishing between a sensitive and a specific test. It was expected that candidates would have researched these terms after reading the pre-release material.

(b) **(i)** Candidates who recognised that smoking was the link between COPD and lung cancer went on to gain both marks. However, many less able candidates did not make this link and failed to gain marks.

(ii) Many candidates described in detail how a CT scan was carried out and gained two or three marks. Some candidates lost a mark for failing to mention that X-rays were taken from different angles. A few candidates confused CT scans with MRI scans and failed to gain marks.

(iii) Many candidates gained two marks for correctly stating that a shorter time in the CT machine would be less stressful for patients and that there would be less risk of radiation causing mutations that might lead to cancer.

(c) This question was generally well answered with many candidates correctly describing the observed differences between the cancer cells and normal cells. A few candidates lost marks because they did not make it clear in their answer which type of cell they were referring to.

(i) Very few candidates gained two marks for correctly naming biological molecules that could act as biomarkers. It was clear that many candidates did not know what was meant by biological molecules and they gave names of inorganic molecules, cells and tissues.

(ii) Only a few more able candidates were able to gain one mark for stating both urine and blood are easy to obtain or that molecules associated with cancer may be present in the urine.

2 This question was based on the case study **'Pregnancy Blog: Countdown to Delivery' (Case Study 2).**

(a) **(i)** More able candidates were able to gain two marks for stating for stating that pregnant women needed more protein, carbohydrate and/or folic acid. A few candidates gained one mark for stating that pregnant women need to stop drinking alcohol or eating unpasteurised cheese. Many candidates failed to gain marks by either just describing a balanced diet or referring to supplements.

(ii) Many candidates gained one mark for stating that Vitamin D is needed for healthy bones or to absorb calcium from the gut.

(iii) More able candidates gained two marks for describing how low haemoglobin would mean that the fetus received less oxygen and that its growth would be stunted. A few candidates lost marks for stating that low oxygen levels resulted in 'abnormalities'.

(b) More able candidates answered this question well, describing how the rubella virus can cross the placenta and cause problems with the development of the fetus. Candidates then went on to say that a positive result means that the pregnant woman is immune to rubella and therefore her baby is not at risk. Less able candidates gave confused answers and referred to the antibodies crossing the placenta and causing problems, which is not correct.

(c) **(i)** Many candidates gained one mark for stating that gestational diabetes occurs during pregnancy and some candidates went on to gain a second mark by describing how diabetes leads to a loss of control of blood glucose concentration.

(ii) This question was poorly answered. Very few candidates were able to name the glucose tolerance test or the fasting blood glucose test, both of which are Learning Outcomes in the F222 specification.

(iii) Many candidates were able to answer this correctly.

(d) **(i)** Many candidates were able to describe how drinking water made the ultrasound image clearer and so gained one mark.

(ii) Many candidates were able to correctly describe how a placenta lying too close to the cervix may lead to heavy bleeding during childbirth.

(e) **(iii)** Some candidates gained two marks for linking high blood pressure to pre-eclampsia and protein in the urine to kidney infection. A few candidates incorrectly linked protein in the urine to diabetes.

3 This question, on HIV and the immune system, proved to be challenging, it discriminated well and the more able candidates were able to develop their answers using the correct scientific terms.

(a) **(i)** This question was well answered by many candidates. They correctly stated that the inactive chemical acted as a placebo and was a control to prove that the vaccine was effective in reducing the risk of infection with HIV.

(ii) The majority of candidates gained two marks on this part question for calculating the risk of infection with HIV using the information in the table.

(iii) Only the more able candidates answered this question well by referring to HIV mutating frequently, giving rise to many strains of the virus and describing how the shapes of the viral antigen changed, so making vaccines ineffective.

(b) **(i)** Many candidates answered this question well by describing how blood can be used to test for HIV antibodies.

(ii) This question was poorly answered and many candidates just rewrote the information given in the question. Candidates were expected to suggest that it takes more than three months for sufficient HIV antibodies or HIV viruses to be produced.

(c) **(iii)** This was the first extended answer and it required candidates to compare the similarities and differences between the roles of B lymphocytes and T killer cells. This question tested a challenging learning outcome from the F222 specification and only the most able candidates gained seven or eight out of eight marks. These candidates described how both B lymphocytes and T lymphocytes undergo clonal selection and clonal expansion, that T helper cells produce cytokines which stimulate clonal expansion of both types of lymphocyte, and that memory cells are produced by both types of lymphocyte. This was followed by describing how B lymphocytes differentiate into plasma cells, which produce antibodies to help to destroy bacteria, and T lymphocytes which become killer cells that destroy cells infected by viruses. Many candidates were clearly aware of aspects of immunity but poor use of terminology or failure to actually address the question meant that they failed to gain full credit.

4 This question tested the candidates understanding of mitosis and apoptosis.

(a) **(i)** This data analysis question was well answered by many candidates. A few candidates, however, lost a mark for failing to give the correct units.

(ii) Many candidates failed to describe the role of mitosis as providing genetically identical cells for the growth of the retina but gained one mark for describing the role of apoptosis to remove unnecessary cells during development of the retina.

(iii) More able candidates gained two marks for stating that the retina would be thinner because more cells have been destroyed by apoptosis and fewer cells produced by mitosis.

(b) This question discriminated well. More able candidates gained seven or eight marks and less able candidates gained three or four marks. Candidates were asked to use the information in the diagram to help them to describe two changes that take place in each stage of mitosis. The changes associated with prophase were generally well known and most candidates commented on the appearance of the chromosomes, the disappearance of the nuclear membrane and the development of the spindle fibres. Some candidate lost marks by referring to the cell membrane rather than the nuclear membrane. Many less able candidates were confused with the changes occurring in metaphase – the most common mistake being to state that chromatids or homologous pairs line up at the equator. More able candidates correctly described how the chromosomes were attached to the spindle fibres by their centromeres. Many candidates gained one mark for describing how the chromatids are pulled apart during anaphase but only the more able candidates referred to the spindle fibres shortening. The changes during telophase were the least well known. Only the more able candidates were able to describe how the spindle fibres disappear, the nuclear membrane reappear and the cytoplasm divide to form two cells.

5 This question testes candidates knowledge and understanding of the risk factors for coronary heart disease

(a) Many candidates were not able to describe that morbidity is the number of people with coronary heart disease and mortality is the number of deaths from coronary heart disease. This was surprising as both terms are referred to in the specification.

(b) **(i)** Many candidates were able to correctly identify the independent and controlled variable.

(ii) Only the more able candidates gained two marks by describing that with a waist circumference of less than 80cm, or between 80cm and 88cm, having a BMI over 30 increases the risk of coronary heart disease.

(iii) Only the more able candidates gained two marks by describing that a waist circumference of more than 88cm greatly increases the risk of coronary heart disease, giving comparative figures to support their statement.

(c) This second extended answer also proved to be challenging. Although the knowledge required was not conceptually difficult, many candidates did not read the question carefully and failed to refer to any drug therapies. Other candidates seemed unsure of what was meant by primary health care and went on to describe surgical procedures carried out in hospitals. The question proved to be discriminating and only the more able candidates gained six or seven marks.

(d) There were a few good answers describing how NICE made sure that the most cost-effective drugs and procedures were available to treat patients with coronary heart disease.

6 This question tested candidates' understanding of the non-specific immune system.

(a) This question discriminated well. More able candidates gained five marks for referring to five different ways in which the body presents barriers to the entry of bacteria. The most common answers included reference to the skin as a physical barrier, acidic conditions in the stomach and vagina killing bacteria, goblet cells producing mucus which bacteria stick to, cilia wafting the mucus and bacteria out of the respiratory tract, and the enzyme, lysozyme, in tears, destroying bacteria.

(b) This gap fill proved to be challenging and only the more able candidates gained four or five out of five marks. It was clear that many candidates did not understand what was meant by the inflammatory response. While the term is not on the specification *per se*, some idea of the concept is needed to address learning outcome 2.4.2(c). It is difficult to explain the role of 'anti-inflammatories' if candidates are not clear what is actually involved in the process of inflammation.

(c) **(i)** Many candidates gained one mark for describing how the size attained as a percentage of post natal growth peaks at nine years, but only a few candidates went on to give accurate figures with units.

(ii) Candidates were expected to suggest that the lymphatic system grows rapidly in the first few years as children are exposed to many different pathogens for the first time. Some candidates did not know the role of the lymphatic system and gave vague answers that did not gain the mark

F223 Practical Tasks in Human Biology

General Comments

The panel of moderators reported commendably on the work and effort that was evident in the majority of scripts submitted for moderation. There was an increase in the evidence of internal moderation and the annotation by teachers to explain the reasons for (or not) awarding marks, which made the moderation process easier.

Centres are asked to note that as the tasks remain live for the **entire** life of the specification, it is not possible for comments to be made on specific questions, or specific tasks, but the following report aims to cover general areas in which centres can improve. It is also therefore essential that no tasks are shown to pupils at any time or used as practice tasks *except* those indicated as practice tasks on Interchange.

Centres that received adjustments this session fell, in the main, into two categories:

- misinterpretation of the published mark schemes e.g. awarding marks for comments which lacked the required detail
- incorrectly awarding marks for points not listed on published mark schemes, which is not permissible in any skill area or task.

Whilst centres are encouraged to give benefit of the doubt, this latter point should be considered carefully. This is, in part, because the tolerance for F223 is 3 marks out of 40.

General Administration

As with last series, there was an increase in the number of centres with clerical errors and again these fell into 4 main categories:

- incorrect addition of marks within the task
- transcription errors from the question to the front cover (leading to an incorrect total on the script)
- addition errors across the three tasks
- transcription errors from the task paper to the coversheet and/or onto the MS1.

Other administration errors were also more common this year including:

- failure to send all three tasks for one or more candidates within the sample
- failure to send the correct tasks for one or more candidates.

Request to remark coursework

After the moderator has checked all the samples submitted by a centre, there are occasions when an invalid order of merit arises i.e. the moderator marks are found to generate a different rank order than that submitted by the centre. This can be as a result of one or two candidates' work which has been marked more leniently than others or by an accumulation of marking errors which has not been flagged up during internal moderation. It is possible that this invalid order of merit could result in a mark adjustment and so the work is returned to the centre, with guidance, for remarking. Naturally this causes concern to all those involved in the marking process. It is very important that Centres do not misunderstand this process. It is intended to benefit as many candidates as possible and to minimise or prevent mark adjustments from occurring.

Mark submission & Sample requests

1. **Submission date**
   Teachers are reminded that all Coursework marking and internal moderation must be completed in good time before the submission of marks (on form MS1) to the moderator and to OCR. The moderator must be in **receipt** of the coursework marks (on Form MS1) **no later than 15 May.** Centres are urged to submit their marks earlier, if at all possible. Please note, if there are ten or fewer candidates entered, please send all of the work to the moderator along with the MS1 form, to be received by 15 May.

2. **Sample requests**
   All centres should note that moderation samples will be automatically generated once the MS1 or EDI submission has been processed. The sample request will be generated electronically and emailed to the contact email address supplied by the centre. It is therefore imperative that the centre email is checked regularly and also forwarded to the appropriate person within the centre. Delays in the moderating process can lead to the publication of results being delayed in August.

   It is beneficial for both OCR and the centre if marks can be submitted by EDI. This will also ensure that the centre is informed of the candidate sample request much sooner and enable more time within the centre for organising and collating the sample.

Submission of the moderation sample

A completed copy of the Centre Authentication Form (CCS160) **must** accompany the MS1 sent to the Moderator. This is an OCR requirement and failure to submit a CCS160 will delay the moderation process. A copy of this can be downloaded from the following site:

http://www.ocr.org.uk/Data/publications/forms/CCS160_All_GQ_Form_Centre_Authentication.pdf

Candidates who wish to resubmit work for F223

Guidance on the resubmission of work for F223 can be found within the FAQ document on Interchange.

Teacher Guidance

Training candidates
Under **no** circumstances can any candidate see the task or mark scheme ahead of attempting the task. The task should be undertaken under controlled conditions. On occasions where the answers of individual candidates appear to “match” the wording, phrasing and ordering of mark points, the work will be raised as a suspected malpractice.

Mark schemes
In all tasks, the mark scheme points have to be applied exactly as printed. There is no procedure that permits the addition of extra marking points. The standard of rigour is determined by the task paper setters. Additional marks must **NOT** be awarded as it is essential that parity is maintained across the entire national cohort.

If there is any ambiguity with any mark point, or areas which teachers think should also be credited, but are not stated on the mark scheme, these should be queried using the email address: GCEScienceTasks@ocr.org.uk. The query will then be directed to the Principal Moderator. Please include your name and Centre number, state clearly which Task your query relates to, and describe which points of the Task, Technician’s Instructions or Mark Scheme you would like to receive clarification for.

Re-moderation requests
Any queries with marks awarded **this** session should be raised through the results enquiry service (details are available from OCR interchange). A Centre may apply for a re-moderation of coursework in accordance with procedures set out in OCR's Results Enquiry Service.

Coursework Consultancy
Any enquires regarding F223 can be addressed to OCR using the free coursework consultancy service.

The coursework enquiry form is available from the OCR website:
http://www.ocr.org.uk/Data/publications/forms/GCW264i_AS_A_Level_GCE_Human_Biology_Units_F223_F226_Coursework_Enquiry_Form.pdf
This form should be completed and sent to OCR at the address stated. This service is free of charge and can be used for guidance and feedback on the accuracy of marking tasks ahead of the submission of marks for moderation. For example, centres can send in photocopies of up to 3 students for (each) separate task and gain feedback on the accuracy of marking. This feedback can be useful ahead of internal moderation within the centre, or indeed before the submission of final marks to OCR.

Areas in which centres may wish to use this service may include:

- clarifying details of the practical task e.g. procedure
- requesting permission from OCR to make ***minor*** changes to the procedure (please note that permission should be sought before the task is completed)
- clarification and interpretation of the mark scheme
- checking the accuracy of marking within the centre by submitting the **photocopied** work of 3 candidates for feedback by a senior moderator ahead of the submission date. Centres should allow 6 weeks for OCR to respond and hence submit the work in plenty of time ahead of the 15th May.

F224 Energy, Reproduction and Populations

General Comments

This paper was accessible to candidates of all abilities and there was very little evidence of questions not being answered in the time allowed.

The quality of handwriting and spelling seen by examiners is still a cause for concern. If a word or scientific term is slightly misspelt, but sounds correct phonetically, then credit will usually be given.

It is also important for a candidate to indicate on their script if an answer has been continued on the additional pages of the question paper.

The overall performance of the cohort produced a relatively normal distribution of marks. Stronger candidates were able to score well on the more challenging questions e.g. **3(b)** and **5**. Candidates at the E/U boundary were able to display their knowledge, particularly in questions **1** and **6**.

Comments on Individual Questions

1 Candidates were presented with a graph comparing the birth and death rates of the UK, Ghana and Nigeria.

(a) **(i)** Candidates were required to suggest reasons for the differences in birth rate between the UK and Nigeria. This was generally well answered with many candidates gaining two marking points mentioning the use of contraception in the UK and the fact that in Nigeria, large families are encouraged in order to support the family through work. Some answers incorrectly stated the possible differences in population size as being a factor even though the figures given on the graph were rate per thousand population.

(ii) This question required candidates to suggest why death rates in Ghana and the UK were the same. Many correctly gave good health care or failure to report deaths as possible reasons. A large proportion of candidates again seemed to misunderstand the concept of death rate, and suggested that it would be affected by population size and/or birth rate.

(b) Candidates were asked to decide whether certain factors affecting human populations were density-dependent or density-independent. Most candidates answered this question well and achieved at least one of the two mark points available.

2 Candidates were presented with a diagram of the male reproductive system.

(a) Very few candidates were able to correctly identify all three structures of the male reproductive system from the list of functions provided. A common mistake was to identify the prostate gland instead of the seminal vesicle and a surprising number failed to state that testosterone is produced in the testis.

(b) **(i)** It was encouraging to note that many candidates were able to correctly identify gonadotrophin releasing hormone.

(ii) Candidates were specifically asked to explain the significance of the surge of LH. Many lost marks by making a very common error, which is to call the *secondary oocyte* an egg or ovum. A good number of candidates correctly referred to the effect of LH on the Graafian follicle prior to ovulation. Very few mentioned that LH also causes the development of the corpus luteum.

(iii) This question required candidates to use their knowledge from other areas of the Human Biology AS specification. Clues were given about the molecular nature of progesterone and good candidates were able to link the non-polar structure with diffusion through the plasma membrane. Many were able to mention the binding of the hormone to the intracellular receptors.

(iv) Many candidates were able to correctly state that the endometrium would thicken, though some merely stated that the lining would be maintained. Only more able candidates then went on to describe the increase in the number of blood vessels, and the increase in mitosis.

(v) The majority of candidates were able to identify apoptosis as the process causing cell deletion in endometrial tissue.

3 This question was based on the biochemistry of respiration.

(a) **(i)(ii)(iii)** It was encouraging to see that most candidates were able to state that **Q** would be formed under anaerobic conditions and that **Q** and **R** were lactate and carbon dioxide respectively.

(iv) Candidates were asked to name the two types of enzymes used to convert pyruvate to acetyl CoA and many were able to give decarboxylase and dehydrogenase.

(v) This question was intended to test the more able candidates and only a minority were able to state that the link reaction could not take place in erythrocytes due to the absence of mitochondria or the enzymes associated with the reaction. Incorrect answers included a lack or a nucleus or that haemoglobin was taking up too much space.

(b) This first extended response question asked candidates to outline the sequence of events of the Krebs cycle. Many answers were very confused and some even related the Calvin cycle. The spelling of oxaloacetate, decarboxylase and dehydrogenase was variable and consequently many did not obtain the QWC mark. Good candidates were able to score highly by giving a logical account of the cycle, step by step.

4 This question assessed the flow of energy through a well-known food chain.

(a) **(i)** It was very encouraging to see that candidates are becoming more adept at calculating percentage change. The majority scored two marks here with some obtaining one mark due to a failure to give the answer to two decimal places as requested.

(ii) Most candidates answered this well, although a significant number were confused by the question and referred to processes such as respiration and movement occurring in the cow rather than the plant. Good answers included a reference to the fact that not all of the plant would be eaten or digested and that some of plants may die in the field.

(b) **(i)** It was hoped that candidates would be able to name a compound in the bodies of dead organisms that contained the element nitrogen. A large number incorrectly gave ammonia, which is produced *after* the decomposition of dead organisms, or 'urine' which is not a compound. Those who did gain a mark usually named amino acids, protein, urea or DNA.

(ii) Many candidates found this question to be challenging and there was a high degree of confusion between nitrifying, denitrifying and nitrogen fixing bacteria.

(iii) Very few candidates identified that the polar properties of water enabled it to act as a solvent for nitrate fertilisers – many giving weak answers such as 'it is a liquid' or 'that it is soluble.'

5 This question assessed the topics of DNA damage and cellular ageing for the first time.

(a) This proved to be a very difficult question for most candidates with only the more able scoring well. Most could identify some of the causes of damage to DNA molecules but failed to give detail of the damage or when it may have occurred. Very few candidates were able to describe the mechanisms of repair with enough precision to obtain marks. Common incorrect answers merely stated that DNA polymerase and DNA ligase were used to identify and repair the DNA without giving any indication of the specific roles they played.

(b) A lack of precision was also apparent in many answers of this question about telomeres. Very few were able to state that telomeres regulate cell division and that they protect the *genes* on the chromosomes. Many answers stated more generally that DNA was protected and that DNA would be exposed or damaged as the telomeres got shorter.

(c) **(i)** Many candidates were successful in answering this question, that the cells may become cancerous, although a significant proportion formed the conclusion that consequently the cell became immortal.

(ii) This question tested a candidate's ability to apply information from the table. A good answer stated that the cells of the liver could continue to divide because there was telomerase activity in the cells or that the telomeres were only slightly shortened. Few were able to answer this well.

(d) **(i)** Encouragingly, most candidates seemed to have a good understanding of enzyme – substrate interactions and the effects of inhibition.

(ii) Most candidates answered this well and identified the fact that side effects would be reduced and that telomerase worked specifically on cancerous cells. A surprising number of candidates, however, were confused by the mode of action of chemotherapy and confused it with radiotherapy.

6 This question was about multiple pregnancies.

(a) Candidates were required to describe how dizygotic and monozygotic twins are formed. On the whole most were able to give adequate accounts.

(b) Most candidates correctly stated 'vanishing twin syndrome'.

(c) Candidates were presented with data concerning the birth of twins in the USA in the year 2000. They were asked to make conclusions based on the data in the table. Unfortunately a large minority simply put much of the information from the table into words and failed to make clear *conclusions* such as the effects of fertility treatment, a history of twins in the family or the age of the mother on the incidence of twins.

(d) Most candidates were able to give two good consequences to the babies of a multiple pregnancy, such as low birth weight, stillbirth or a named developmental problem.

F225 Genetics, Control and Ageing

General Comments

Some excellent answers were seen and those candidates who were well-grounded in making synoptic links performed well. A03 questions proved a challenge for many candidates on this paper and there was considerable evidence that, as in previous sessions, terminology is being learned by candidates without it being really understood – this was particularly true in **Q3**.

As in previous sessions, several candidates misinterpreted the requirements of the question and provided answers to questions which were not in fact being asked. This was particularly noticeable in Question **4** – particularly in **4(c)**. The examiners also noted the tendency for candidates to re-use either terms or information which was provided in the stem of the question e.g. **1(b)(i)** and **2(f)(i)**, where the terms 'injury' and 'random' were used without any further development or amplification. This was also the case in **4(b)(ii)** where many candidates repeated the fact that alcohol prevents glucose production by the liver – again information that was given in the question.

The extra time now available to candidates does not necessarily mean an increase in free response type questions. Question styles such as the genetics question **3(b)(ii)** are a valid way of testing knowledge with understanding. However, while some candidates had clearly attempted to work out the correct answer using genetic diagrams, the majority appeared to just 'have a go'. Performance on this, and similar questions, benefits from 'thinking' time and rough working – a better use of the additional time provided.

Many candidates made extensive use of the additional pages at the end of the paper. However, some candidates are still not making it clear that their answer continues on these pages, and other candidates continue to use space at the side and bottom of the page. Examiners are instructed to mark any material which is written but centres should be aware that such material is at an increased risk of being inadvertently overlooked. The order of the answers on the additional paper was frequently not that of the original questions – suggesting candidates are using extra time to read through and amend or amplify earlier answers. While this is sensible, most of the material seen was simply a repeat or amplification of earlier points made.

Comments on Individual Questions

1 This question was designed to be an accessible start to the examination. Part **(a)** was intended to be a gentle introduction, with a diagram provided. A minority of candidates were unfamiliar with a reflex arc diagram.

(a) Most candidates scored well on this question. The commonest mistake was to refer to **Q** as the dorsal root ganglion or even ganglion cell. A ganglion is a mass of nerve cell bodies and the label line was clearly pointing to a single structure. There was some evidence again that the terms 'axon' and 'dendron' are not well understood and incorrect use of these terms could not be credited.

(b) Candidates who lost marks on part **(i)** of this question did so mainly by referring to 'injuries' caused by a sudden blow to the head. One not uncommon misconception was that 'traumatic' referred either to severity or the duration of the effect of the injury.

In part **(ii),** surprisingly few candidates referred to the action of the magnets in an MRI machine and their effect at a molecular level and how that could then be interpreted. This is synoptic with F222 (learning outcome 2.1.2(c)) and the link with how the technique works clearly needs to be reinforced in teaching here. Some candidates confuse CT scans, thermal imaging and MRI scans.

2 This question assessed **A01**, **AO2** and **AO3** skills. For AO3, evidence in support of a conclusion had to be extracted from a data set. There were some synoptic links to F221 (differential staining) and F222 (clinical trials).

(a) In **(i)**, most candidates correctly identified those cells which were sickle shape. Candidates who lost marks did so either by not referring to erythrocytes or red blood cells or they did not refer to the insert. Similarly in **(ii)**, many candidates explained the role of a differential stain but ignored the instruction in the question to providing evidence for its use in their answer and some reference to the colour of structures stained was expected.

Teaching Tip:
Use several 'question types' in testing material from earlier units in class. Synoptic material is not likely to be tested as AO1 (recall) on an A2 paper.

(b) **(i)** While most candidates were clearly aware of specific palindromic sites and the production of blunt or sticky ends, one common misconception was that the enzyme 'cut out' the restriction site – suggesting some confusion here with exons possibly.

(ii) This stretch and challenge question required candidates to appreciate that only one site would be affected by this mutation and better candidates grasped this: "....the enzyme would have to travel further along the DNA until it found a site to cut giving longer lengths". Some candidates tried to explain this in terms of changes to the amino acids in the polypeptide or that a 'stop' codon had mutated.

(c) This was also a 'stretch and challenge' question with candidates needing to appreciate that the presence of both alleles in the heterozygote would lead to both types of DNA being present and hence both bands appearing – a fact that was only appreciated by a small proportion of candidates.

(d) It was clear that not all candidates were familiar with the phrase, 'pattern of inheritance', with some giving answers such as 'genetic' or 'from parents in gametes'. This suggests that the concept needs to be emphasised more with respect to those examples listed in the learning outcomes.

(e) This was synoptic with both F221 and F224 and most candidates found this very accessible. The most common mistake was to state 'tertiary' rather than 'quaternary' structure, or 'partial pressure' instead of 'affinity'.

(f) Again, **(i)** was a synoptic question but a surprising number of candidates, including the most able, struggled to explain it well. While the concept of 'double blind' was reasonably well understood, candidates failed to explain the meaning of randomised. Some serious misconceptions were seen – for example, that the participants in the trial were chosen randomly from a population. The idea of recruiting participants to a trial, all of whom would have SCA was clearly not appreciated. Candidates would also benefit from exploring what the term 'random' actually means in terms of 'chance'. Some candidates seemed to think that, in a double blind trial, 'neither the doctor nor the patient know the aim of the experiment'.

In **(ii),** candidates used several methods which correctly 'proved' the increase was 72%. Where a less 'traditional' method was used, the examiners looked for some evidence of the reasoning behind the calculation and this approach seemed to benefit those students with a more empirical approach to maths.

Part **(f)(iii)** was done well although some candidates added % to figures which were not percentages, indicating that, although well taught in the need to use units, they do not really consider the data carefully.

In part **(iv)** some good ideas failed to score due to terminology that was not up to standard – the idea of immunity being a case of 'fights and battles' is not appropriate at A2. There were some excellent suggestions made with the most common begin the tendency of those on the placebo being more prone to infections and an explanation of the role of the neutrophil as a phagocyte.

Teaching Tip:
Immunity and the action of antibodies can be linked to several learning outcomes in F225 (e.g. 5.1.1(c)) and ABO blood groups, 5.1.4(a) and transplantation). Review F222 (2.3.2) and check that the terminology is still being used appropriately.

3 Despite the fact that over half the marks on this question were **AO1** and hence recall, this question proved to be the best discriminator on the paper.

(a) In part **(i)**, the majority of candidates successfully identified the two cells and, where they did not, the letters were correct but the order was reversed. In part **(ii)**, the examiners saw some outstanding answers from students who had clearly been very well taught. The main misconception amongst weaker students was to confuse hyperpolarisation with depolarisation, sodium channels opening rather than closing, incorrectly naming neurotransmitters or describing action potentials 'crossing the synapse from one cell to the next one' rather than describing transmission at a synapse. Many candidates seem unaware that the axons of the ganglion cells make up the optic nerve and suggested that the ganglion cell synapsed to another neurone (the optic nerve).

(b) Part **(i)** was yet another example where weaknesses in understanding terminology led to loss of marks. While candidates are clearly familiar with the phrase 'sex linkage', too many referred to the disease rather than the **gene** or, better still, the **gene locus** being present on one of the sex chromosomes only. There were lengthy descriptions of examples such as haemophilia being more common in males than females and a tendency to talk about alleles rather than genes. '*The allele for the disease is carried on one of the sex chromosomes*' could mean that the normal allele is carried on the other sex chromosome. Gene and allele are not interchangeable terms.

In **(ii)** only about 30% of candidates had attempted to use genetic diagrams to work out the answers. This question was targeted across the full range of difficulty and while the fourth response was straightforward, the rest needed careful thought or, better still, calculation – a good use of the additional time available.

Part **(iii)** of this section was done well although a surprising number of students appear to think that colour blindness is treatable. '*Early diagnosis is useful so it can be treated before it progresses to full blindness'.*

There is considerable confusion amongst weaker candidates in part **(iv)** between glaucoma and macular degeneration, with several describing build up of pressure in the eye leading to a damaged retina. There was also a tendency to describe the symptoms rather than explain why there was a lack of colour vision *'macular degeneration leads to central vision being lost'.* Surprisingly, few candidates pointed out that this was where the majority of cone cells are, and even fewer were able to explain that the reduction in light intensity due to cataracts would mean cone cells were not stimulated. Instead the 'fuzziness' due to cataracts was thought by many to lead to a blurring of colours – with several candidates referencing to 'Monet's Garden'.

4 This question again had elements of **AO1** but mainly addressed **AO2** and **AO3** objectives.

(a) Drug dependency is clearly a topic with which candidates are familiar but this was a predominantly **AO2** question which required them to link their knowledge of dependency specifically to alcohol and the statements provided. The commonest reason for loss of marks was either not to use a statement to illustrate what a drug is or to discuss 'drugs' in general with no specific reference to alcohol outside the use of the statements. Mark point 1 was frequently omitted even in otherwise good answers and some candidates confused the two types of dependency.

(b) **(i)** This was synoptic with F224 and proved to be reasonably accessible although weaker candidates had a tendency to group 'glycolysis, link and Krebs cycle' as a trio of terms.

In **(ii),** despite the information given in the question, a considerable number of candidates thought that alcohol contained glucose or increased blood glucose levels. There was confusion between hyper and hypoglycaemia and many students suggested that eating would 'mop up' the alcohol.

(c) Two graphs were provided in part **(i)**, a line graph which clearly showed a decline in death rate due to alcohol as a % of all deaths, and a bar chart which showed an increase number of deaths due to alcohol. The aim of the question was to reconcile the seemingly conflicting sets of data. An overwhelming majority of candidates failed to comment at all on the first graph and concentrated instead on describing the changing pattern of mortality on the second graph. Time is now available for carefully reading the question and it was clear to examiners from the lack of highlighting on papers that this is not happening as much as it should.

Teaching Tip:
Build in 'thinking time' at the beginning of AO2 type questions in class by not allowing candidates to put 'pen to paper' for at least one full minute. 'More marks are lost from not reading questions than not knowing answers'.

Part **(ii)** was done well with most candidates illustrating their comparison with appropriate use of data. Yet again, however, some candidates attempted to describe how the pattern changed over each age group shown on the graph, rather than comparing the two age groups given in the question.

5 Although some **AO1** marks were available on part **(a)** and **(c)**, the majority of marks on this question were **AO2** and a number of synoptic links were tested from F221 and F224. Consequently, this question overall proved to be an excellent discriminator.

(a) Many candidates were able to 'recall' **(AO1)** what homeostasis was and to state that negative feedback was happening and that a rise in blood pressure triggered a mechanism which resulted in a fall. The best candidates correctly used the idea of receptors and effectors and were able to identify these, and some excellent responses were seen that explained why it was so important to maintain blood pressure. The examiners were not happy with the idea of a 'constant' internal environment – the fact that blood pressure itself varies between systolic and diastolic is a strong argument in favour of the word 'stable'.

(b) Most candidates again failed to read the information given in **(b)(i).** This was an AO2 and a 'stretch and challenge' question and candidates were being asked to deduce the fact that, as a steroid hormone, receptors for aldosterone would be inside the cells. This was rarely seen. Part **(ii)** was synoptic and good candidates could explain the osmotic effect well using appropriate terminology.

(c) This question proved to be more challenging than anticipated. While candidates did not appear to have too much difficulty identifying the inappropriate words, (ester, substrate and identical) and substitute 'complementary' for identical or weaker, candidates suggested hydrogen bonds or one from a range of molecules from the passage as alternatives. Even otherwise good candidates did not seem to have retained the term 'product' in the context of an enzyme reaction.

(d) The question clearly stated that the calcium ions were binding to muscle cells so it was disappointing yet again to read descriptions of the action of calcium ions in neurones and synapses. Again this was synoptic with F224 and where candidates appreciated the role of calcium ions in muscle contraction, this was done well although examiners saw references to 'the power stroke' which were too vague to credit.

6 This question had elements from all three assessment outcomes with candidates being asked to explain the pattern shown by the data in part **(a)**. The erratum notice was intended to emphasise that it was an explanation rather than description which was required and it was clear that candidates had been made aware of this.

(a) This was answered well although a common failing was to describe the changes to birth rate without explaining the changes in fertility which brought these about. However, most candidates could identify the consequence of the menopause and did go on to give reasons for the more gradual decline in males.

(b) Many students suggested legal reasons for the lack of data for 16 year old males or the later onset of puberty. There were one or two more 'earthy' suggestions but the vast majority of students gave thoughtful and considered answers.

(c) Most candidates completed the calculation in part **(i)** with little difficulty although marks were lost for failing to round correctly or for giving incorrect units. In part **(ii)** most candidates scored at least one mark with the commonest statements referring either to loss in elasticity or difficulty in moving the rib cage. General statements about lung volumes could not be credited – there was an element of synopticity with F221. Candidates also need to be clear that, where a specific number of statements are required, and the lines are numbered, only the first statement on the line will be credited – even if subsequent correct statements are made. References to changes due to illness or disease were not credited since the question was about ageing.

F226 Extended Investigation in Human Biology

There was, again, evidence of a lot of hard work both on the part of candidates and teachers in the F226 unit. There was work which was well executed and presented and deservedly gained high marks.

Encouragingly there was evidence to show that centres who had made use of the free coursework consultancy service had acted on the feedback given and this had resulted in work being more accurately marked. The use of the marking grids was also more apparent and this too led to more accurate marking and less discrepancies between centre and moderator marks.

Suitability of investigations:

One main concern for this session was that some centres had permitted candidates to undertake investigations which were inappropriate and/or not permitted by OCR, as stated in the Teacher Support: Extended Investigation handbook. **Inappropriate** investigations included:

1. Any investigation involving Daphnia
2. Any investigation involving administering caffeine, paracetamol or similar chemicals/medicines.

As stated in the Extended Investigation Guidance handbook OCR does **not** permit Investigations that involve the administration of alcohol, caffeine, nicotine and other similar substances to human participants. No investigation that potentially causes harm to participants should be undertaken (e.g. exposure to inhaled particulates/air pollution). If the centre is in doubt about any title then this should be checked with OCR **before** any work is started on the investigation by the candidate(s).

It is **essential** that investigations are be centred on an A2 learning objective from either F224 or F225. The topic should also allow scientific knowledge and understanding from F221 and/or F222 to be used and integrated to enable the prediction to be justified and conclusions explained. Submission of AS based investigations will not allow access to all descriptors including A4 and C4 which will reduce the overall attainment of the candidate(s). Submission of investigations which fail to be centred on any direct aspect of the specification will not enable access to A3, A4, C3 and C5, as well as reducing the likelihood of meeting other descriptors.

All queries relating to F226 can be raised with OCR via email at: GCESciencetasks@ocr.org.uk clearly stating the centre number and nature of the enquiry.

General administration:

Centres are encouraged to use the cover sheet provided by OCR for each candidate to show clearly which descriptors have been awarded by the centre and also the overall total for the piece of work.

Centres are should note that a Centre Authentication Form (CCS160) **must** be submitted. Failure to do so will mean that this has to be requested at a later date and could potentially delay the publication of candidates' results.

Most forms that will be required for any particular session can be found on the website: http://www.ocr.org.uk/qualifications/publications/AS_ALevelGCEHumanBiology.html

Request to remark work after submission
After the moderator has checked all the samples submitted by a centre there are occasions when an invalid order of merit occurs i.e. the moderator marks are found to generate a different rank order than that submitted by the centre. This can be as a result of one or two candidates' work which has been marked more leniently than that of others or by an accumulation of marking errors which have not been flagged up during internal moderation. It is possible that this invalid order of merit could result in a mark adjustment and so the work is returned to the centre, with guidance, for remarking. Naturally this causes concern to all those involved in the marking process. It is very important that Centres do not misunderstand this process. It is intended to benefit as may candidates as possible.

Adjustment to centre marks:

In the main, adjustments were due to centres:
- choosing an inappropriate investigation
- misinterpreting the demand and requirements of the descriptors
- marking erratically / inconsistently within the centre – this was more evident in centres where candidates had completed many different investigations

Descriptors which were commonly misinterpreted were:

- A3 and A4
  - Theory from F224 or F225 should be used
  - Key A2 terms used
  - Justifies prediction (not segregated theory)
  - Justification is to an A2 standard

- A10
  - Sufficiently detailed to allow replication by student
  - Clearly states how precise data will be collected
  - Clearly states how accurate data will be collected
  - Highlights area for care and/or speed needed
  - Details how limitations and sources of error will be minimised
  - States how key factors will be controlled/regulated

- A12
  - Justifies selection of apparatus
  - Justifies and explains measurement/control of variables
  - Critical points in strategy identified e.g. acclimatisation
  - Explains why chosen method was selected over others

- B10
  - Plots graph by hand
  - Plots processed data
  - Informative title
  - Appropriate type of graph
  - Scaled appropriately – plot area covers 50% of available graph paper
  - X and y axes scaled in appropriate increments
  - Axes orientated correctly (IV on x-axis)
  - Both axes clearly labelled ('mean' not 'average')
  - SI units for IV and DV
  - All data plotted accurately (± ½ small grid square)
  - Line graph: plot-to-plot with line not extended beyond first and last plot
  - Bar chart: bars of equal width and spaced
  - Histogram: bars of equal width (assuming equal size groups) and bars touching

- C3 (& C4)
  - Theory from F221 or F222 (or F224 or F225)
  - Key AS or A2 terms used
  - Explains conclusions (not segregated theory)
  - AS (or A2) standard

- C5
  Comments on at least two of the following:
  - concordancy of data
  - size of SD or size of SE for each set of raw data
  - size of range bars
  - size of error bars
  - Identifies most and least reliable raw data set (raw data)

- C6
  Comments on at least two of the following:
  - Discusses the percentage error of pieces of equipment and effect on raw data
  - Discusses how the raw data has affected the trend line
  - Discusses how close the raw data is to the line of best fit (NB this is not the same as the closeness of the means to the line of best fit/trend line)

- C7
  - Discusses the reliability of the procedure (not the raw or processed data)
  - Suggests at least two appropriate and significant sources of error (not limitations) which could affect the reliability of the procedure

- C9/10
  - Explains the effect of one of the limitations suggested for C8
  - Discusses the effect on the accuracy /precision of the raw data (not processed data) e.g. times shorter/longer, volumes higher/lower

- C12/C13
  - Explains the effect of one of the improvements suggested for C11
  - Explains how improvement is likely to bring data points closer to a line of best fit or bring the trend line closer to the predicted trend line

Teacher support
There are various levels and types of support available for teachers/centres:

a) Extended Investigation Handbook
This document is available to download from the OCR website and provides detailed guidance about all aspects of F226.

b) Email support
Centres can seek further advice on the implementation and marking of the Extended Investigation in future sessions by e-mailing GCESciencetasks@ocr.org.uk.
Please include your name and Centre number, state clearly which skill your query relates to, and state which descriptors would like to receive clarification for. This service can be used for enquiries such as:
- Title approval
- Descriptor clarification
- Marking guidance

c) Coursework Consultancy

Centres are reminded that there is a free Coursework Consultancy service that is provided. This service can be used to seek feedback on the accuracy of marking of candidates work **before** submission of marks and the moderation. To take advantage of this service work from a maximum of 5 candidates should be photocopied and sent to the Qualifications Manager at OCR. Further details can be requested via email at GCESciencetasks@ocr.org.uk. Work will be returned with feedback in the form of marking grids which can then be used by the centre for future marking.

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