OCR
RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced GCE **A2 H421**

Advanced Subsidiary GCE **AS H021**

Report on the Units

June 2009

Oxford Cambridge and RSA Examinations

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

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

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

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REPORTS ON UNITS

Chief Examiner's report

This June marks the first occasion on which all three AS units were offered and when candidates were able to aggregate the 'new' Biology qualification (HO21). There has been a significant increase in entries, with the June 2009 entry for F212 being in excess of 30 000.

While there can be no changes to learning outcomes until there is a formal revision of the specification, centres do need to be aware that guidance on the administration of the practical tasks is likely to be updated during the lifetime of the specification. It is the responsibility of centres to use the most up to date version of both the specification and the Practical Skills Handbook. The latest version is always the version which is published on the website and Interchange, and they should be checked periodically. Materials which are on Interchange are dated so it is possible to see where, if any, changes have been made. By registering with Interchange, an e-mail alert is automatically sent to inform of any changes made. Many teachers find this a useful 'prompt' and this service is free. To be notified by e-mail when changes are made to GCE Biology pages, please e-mail GCEsciencetasks@ocr.org.uk including your centre number, centre name, a contact name and the subject line **GCE Biology**. **It is strongly recommended that all centres register for this service.**

Understanding and Answering the Questions

The question papers for this new specification are marked online, by which the papers are scanned and the Examiners view and mark the responses on screen.

Although care is taken to supply the candidates with adequate space or answer lines for each question, some candidates habitually use more space than that provided and continue answers on other parts of the page or paper. This is not a problem, as Examiners will mark all answers. However, candidates run the risk of wasting time and effort on a question that does not warrant it, given the mark allocation. Candidates should use the wording of the question and both the mark allocation and the available space as a guide to the amount of information that is expected.

It is most important that the location of any continued answer is indicated in the allocated space for the answer or as close as possible to the lines provided for the answer. This is particularly important as these papers are marked electronically and the Examiner can then look for the remainder of the answer in the appropriate place.

This electronic method of marking allows NR or 'No Response' rates to be calculated. On F212, a surprisingly high number of candidates did not respond to questions that related to clear learning outcomes in the specification. It is these straightforward 'recall' questions that candidates are expected to attempt with a fair degree of confidence. Each question paper covers all three assessment objectives; recall (AO1) forms less than 50% of F211 and decreases proportionally through the following theory units. Candidates should therefore be prepared so that they can take full advantage of accumulating marks from these straightforward and obvious questions. In order to capitalise on this, there are many key terms and definitions on the specification that can be 'rote learned'. This includes one of the areas that was not attempted in F212 – the causative organism and vector of malaria. They make good 'starters' for lessons and good 'quick tests' and 'word banks'.

It is also important that candidates fully understand the command words used in questions, a glossary of which can be found in the Practical Skills Handbook. A common problem is that candidates are unable to distinguish between 'describe' and 'explain'. This can have a knock-on effect as an 'explain' question often follows a 'describe', and if candidates have already provided

an explanation for the 'describe' question, then they are unlikely to answer the 'explain' question adequately as it will involve repeating information already provided.

There has been evidence in F211 that candidates' understanding of heart structure and function is less than that seen in previous years. This probably reflects changes to the GCSE content. It is important to consider the changes in the GCSE specifications and to ensure that material that had been traditionally covered at GCSE (but which has now been removed) is adequately covered at A level.

Dealing with Data

The new format for the Practical Skills Assessment units (F213 and F216) requires data handling skills to be taught. The presentation of data in terms of correct units and decimal points is one of these skills and applies both to the practical tasks and the theory papers. The rigour that is expected in the tasks is the same as that expected on the theory papers. Candidates should expect to give accurate data quotes with correct units. The answers to calculations should be given to the correct number of decimal places or to the nearest whole number. While a prompt to this effect is sometimes given at AS, this will not normally be the case at A2. Candidates are expected to use their common sense in the absence of such prompts, such as giving the answer to Q4(a)(ii) in F212 to the nearest whole number (as it referred to a population of vultures, so giving the answer to the nearest whole number of vultures). Candidates should appreciate the need for consistency in decimal points when expressing values in tables, whether these are recorded values or calculated data.

Candidates should expect to see questions requiring calculations on most papers and should be prepared to manipulate figures as instructed, in addition to the more traditional calculations involving percentages and magnification and those specific calculations detailed in the specification as learning outcomes. Further guidance is provided in the Mathematical Requirements section of the specification. There is evidence in every session that some candidates enter the examination room without a calculator and therefore deprive themselves unnecessarily of marks that they could otherwise gain.

Presentation

Examiners commented on the number of scripts with poor or very poor handwriting. Candidates should be reminded that the Examiner, unlike the teacher who has become accustomed to deciphering a student's handwriting, is likely to find poor handwriting a challenge when meeting it for the first time.

Centres will notice several references to imprecise or poor expression in the reports. Candidates need to be reminded that Examiners cannot mark what a candidate 'means' – only what they 'write'. In both F212 and F215, extended writing will be a significant feature. The ability to write clearly and concisely is obviously more important when more marks are at stake. Candidates need practice at selecting and organising information and then presenting it in a coherent manner. With the increasing use of 'student presentations' in teaching, and the ability of candidates to cut and paste descriptions and explanations to construct their presentations, they often have little practice in structuring descriptions or explanations 'from scratch'.

Practical Assessment

As the format of the practical assessment was new for everyone, many centres made good use of the free 'coursework consultancy' service offered by OCR to check they were interpreting the mark schemes correctly. Centres are encouraged to make use of this service, further details of which are given in the Practical Skills Handbook.

Centres are also encouraged to check the material on Interchange periodically, and particularly before using a particular assessment task, in case any amendments or additional guidance has been included. By signing up to the email alerts, centres can be informed of such notifications.

The comments and advice of the Principal Moderator in this report should be noted with care. While many centres are to be congratulated on their marking, internal moderation and administration, a significant concern expressed by the Principal Moderator was the number of centres that submitted work late and did not respond or responded slowly to requests for additional samples or other queries. Members of staff with responsibility for the subject are urged to ensure that the email address that has been registered with OCR is checked regularly so that requests can be dealt with as soon as possible. This will reduce the possibility of any delay in the publication of the centre's results in August. When applying professional judgement to crediting information that does not appear on the mark scheme, it is very important to ensure that this information is actually answering the question that has been set and is not just correct biological information that has some more tenuous link to the question. This will mean that some centres will find that marks have been adjusted, not because the biology was incorrect but because of the context. It is very important to maintain consistency in the application of the mark scheme across all candidates. Some centres will find that their marks were adjusted due to errors in addition, transcription of marks and failure to check candidate's calculations – all of which are easily avoidable.

F213 is a free standing unit and, as such, candidates can 're-sit'. However, the rules on re-submitting work are clear and centres are strongly advised to familiarise themselves thoroughly with the procedure. It should be stressed that **under no circumstances** should the task sheet be returned to a candidate for 're-writing' and **under no circumstances** should a candidate 're-do' a task they have already done – whether it was submitted as part of their final mark in a previous session or not.

INSET

OCR has a full programme of training events for the autumn and spring terms. Further details can be obtained from the OCR website www.ocr.org.uk and are also provided on page 4.

Upcoming INSET events in 2009/2010

OCR AS Level Biology (H021): *Get ahead – raising standards through exam feedback*

This **full day** course will:

- Allow you to share good practice and ideas on new approaches
- Demonstrate standards for the internal assessment of coursework and externally assessed components
- Consider post-summer results documentation, such as question papers, reports and mark schemes
- Discuss helpful approaches for preparing candidates for the external examination
- Review the support and resources available from OCR.

Course dates and codes – Tuesday 22 September 2009 (Birmingham, course code OSCH4, event code 01), Wednesday 30 September 2009 (Plymouth, course code OSCH4, event code 02), Friday 2 October 2009 (London, course code OSCH4, event code 03), Monday 5 October 2009 (Newport, course code OSCH4, event code 04), Monday 12 October 2009 (Durham, course code OSCH4, event code 05), Friday 2 November 2009 (Manchester, course code OSCH4, event code 06), Wednesday 25 November 2009 (Birmingham, course code OSCH4, event code 07), Thursday 10 December 2009 (London, course code OSCH4, event code 08).

Fee – £173 including refreshments, lunch and course materials. £205 if you book within 7 days of the course date.

OCR AS Level Biology (H021): *Get Started – successful first delivery*

This **full day course** will:

- Review the support and resources available from OCR
- Answer teachers' questions linked to the teaching of the standards
- Explain the administration procedures for assessment of coursework and/or testing
- Provide an opportunity to network and share ideas for best practice.

Course dates and codes – Thursday 25 February 2010 (London, course code OSCH3, event code 01), Wednesday 10 March 2010 (Birmingham, course code OSCH3, event code 02).

Note: this course is an updated version of the sessions that ran in previous years.

Fee – £173 including refreshments, lunch and course materials. £205 if you book within 7 days of the course date.

To book a course

Online: you can view and book your training event online by visiting our new EventBooker service at **www.ocr.org.uk/eventbooker**
By e-mail: use the booking form on **www.ocr.org.uk** and e-mail it to: **training@ocr.org.uk**
By fax: please complete and return the booking form to: 024 7649 6399
By post: please complete and return the booking form to: OCR Training, Progress House, Westwood Way, Coventry CV4 8JQ

Please note: we cannot take telephone or provisional bookings.
Please note: training programmes are correct at time of going to print. Please visit EventBooker at **www.ocr.org.uk/eventbooker** to search for the most up-to-date event details.

F211 Cells, Exchange and Transport

General Comments

Examiners were again pleased to see that candidates had been well prepared for this examination. All areas tested were attempted by the majority of candidates and there was no evidence that a significant number of candidates ran short of time. The examination has discriminated well achieving a wide spread of marks from the 16000 candidates entered.

There were two areas within the paper that raised some concern amongst the examiners. Both are areas where a significant number of candidates gave very confused responses. The first was in question 1, where a lot of candidates seemed to confuse goblet cells in the bronchus epithelium with phagocytic cells. The second was in question five where a lot of candidates seemed to think that meiosis and fertilisation are the same process. Centres should ensure that such areas of confusion are taught carefully and thoroughly. Microscope slides or micrographs from the internet can be a good resource to help students understand the structures and processes involved.

Comments on Individual Questions

Question 1

Question 1(a)(i) was a very easy starter, it was generally well answered although a few candidates managed to mix up the two types of cell. Some candidates lost marks unnecessarily for naming cell B as a 'cilia cell' rather than a 'ciliated cell'.

In Question 1(a)(ii) many candidates achieved full marks but there was a very significant minority who gave answers such as: 'cell B (ciliated cells) catch the dust and move it to cell A (goblet cell) which gobbles it up'. This sort of response suggests that candidates have not seen slides of ciliated epithelium and are possibly confusing the goblet cells with phagocytes undergoing phagocytosis.

Question 1(a)(iii) demonstrated a lack of understanding about the role of smooth muscle by many candidates. The inevitable 'allows air to flow with little friction' was seen as well as 'allows blood to flow with little friction' which shows that these candidates really were just recalling (incorrect) information without thinking about the question. Many candidates suggested that the role of the muscle was 'to contract' or 'to contract and relax' without suggesting why this might be required. Examiners were looking for the idea of reducing the diameter of the airway.

In question 1(b)(i) examiners were pleased to see that most candidates scored well – an improvement over the January session where a similar question was not answered well. Those who didn't score marks lacked understanding about concentration gradients and diffusion.

Question 1(b)(ii) demonstrated a lack of understanding about how the lungs work. Very few candidates were able to state that the elastic fibres are stretched on inhaling and then recoil to help fully expel the air. Too many candidates use the term 'contract' in place of 'recoil'. Some candidates answered in the context of elastic fibres in the bronchus wall and most seem to think that the alveoli would not stretch without elastic fibres.

Teaching tip:

Stress to candidates that cilia are not hairs – vague descriptions of hairs on the surface of cells does not gain credit.
Use teaching time to relate the structures and processes to everyday events. At a time when more and more young people are affected by asthma, teaching about smooth muscle in the airways can explain how asthma occurs and why an inhaled muscle relaxant can reduce the symptoms.
Use a balloon or rubber bands as a classroom demonstration of the action of elastic fibres in the alveoli.

Question 2

Generally, question 2 was answered reasonably well and many candidates achieved good marks. However, examiners felt that the question differentiated between candidates well.

In Question 2(a)(i) the majority of candidates correctly identified D and F as cholesterol and the phospholipid bilayer. However, structure E was rarely identified accurately as a protein or glycoprotein. By far the most common answer for E was 'glycolipid'. This inaccuracy possibly reflects the fact that E was not drawn in the same way as glycoproteins are usually seen drawn. Candidates should be able to identify a structure from their knowledge of the components of a cell membrane and not rely on recalling familiar shapes and structures.

Weaker candidates found part 2(a)(ii) less easy than 2(a)(i) although better candidates achieved good marks. In describing the role of D (cholesterol), alot of candidates lost marks for referring to the ‘strength’ or 'rigidity' of the cell membrane rather than the fluidity. The model is known as a fluid mosaic model, and if membranes were rigid, cells would be unable to perform many of their functions. Despite not correctly identifying E, many candidates were able to recognise its possible role as a receptor used in cell signalling, cell attachment or cell recognition. Few candidates recognised that E could be a carrier protein or a pore protein. Many candidates described the role of F simply as 'keeping the contents and outside separate'. This was considered to be rather vague for AS level biology and examiners were looking for the idea of controlling what molecules or substances could enter or leave the cell.

In question 2(b)(i) the majority of candidates gained a mark for the idea of 'communication between cells'. However, less than half picked up a second mark by providing a little more detail.

Question 2(b)(ii) proved to be one of the harder parts of the question to answer. Many candidates vaguely suggested that part of the molecule ‘stuck out from the cell’ enabling it to make contact with other cells. Examiners were looking for the idea of specific and complementary shapes that allowed binding of the messenger molecule to the receptor. Some candidates gained credit for the idea of attachment or binding, but few candidates gained further credit – largely because of the vague use of weak descriptive language and an absence of technical terms such as ‘specific’ and ‘complementary’.

Few candidates gained full marks in question 2(c)(i). It was clear that most candidates understood that the pigment entered the water but had little idea of how or why. Many candidates gained one mark for the idea of 'pigment leaking out of the cell’ and many candidates had the idea that a membrane would be damaged by the high temperature, and some even referred to phospholipid bilayers. However, few realised that it must be the plasma membrane or cell surface membrane that was damaged to allow the pigment to leak out. Also very few candidates seemed to understand that the pigment must absorb the light to prevent

transmission. Many simply restated that the light was not transmitted or came up with some hypothesis to do with metabolic processes being disrupted by the high temperature which meant that the pigment was no longer produced. Some lower ability candidates had the water evaporating away to concentrate the pigment or even pigment evaporating away with the water thus somehow preventing transmission.

Evaluating a procedure and suggesting improvements as seen in question 2(c)(ii) is an area where candidates have shown great improvement. The majority of candidates achieved at least two marks of the three available. The most common answer was to repeat the experiment, and the most common error was to refer to increasing the range of temperatures. A minority referred to alternative investigations with other vegetables rather than focusing on the given investigation. Lack of precision still lets candidates down. There are some good candidates who refer to more than two repeats for reliability - but a lot who refer to 'amount' rather than 'volume' of water or suggest increasing the 'range' of temperatures when they mean the 'number of temperature values'.

Teaching tip:

Ensure that candidates understand the difference between range and number of readings. The range refers to the extremes of temperatures used – in this case 10 to 100 °C. Increasing the range would mean using 0 – 100 °C but may not mean including more readings within that range.

Question 3

Question 3(a) was generally well done. Common errors were to write 'diffusion' in place of 'osmosis' and to write 'pores' in place of 'stomata'.

In question 3(b)(i), the majority of candidates seemed to miss the point. A large proportion attempted to explain why water is lost in terms of the difference in water potential between inside and outside the leaf. This explains why water is lost when the stomata are open, but does not explain why it is unavoidable. A good number of candidates suggested that transpiration is necessary to pull ions up the plant. Few related the need for gaseous exchange to open stomata and the subsequent loss of water vapour.

In 3(b)(ii) nearly half the candidates gave the response 'cactus'. Some gave odd spellings such as 'xerocyte'.

Question 3(b)(iii) was much better answered. The most common answers referred to hairs, curled leaves and cuticle. Often these were backed up by a reasonable explanation of why the feature helped to reduce water loss. However, all too frequently, candidates lost credit because they were too vague or not quite detailed enough. Many referred to a waxy cuticle but did not state that this needed to be thick, others referred to 'water' rather than 'water vapour' around the stomata and many candidates wasted time by describing more than 2 adaptations.

Question 4

In question 4(a) candidates were expected to complete the table by providing a suitable comparison to the information given. Those who failed to mention that in eukaryotic cells DNA is found in the form of chromosomes or associated with histones misunderstood what is meant by 'naked' DNA. This resulted in an incorrect comparison and these candidates often described the presence of a nuclear membrane. When presented with a figure for the average diameter of prokaryotic cells many candidates were unable to quote a figure for eukaryotic cell size or quoted a figure outside the generous range allowed (10 - 100μm). Similarly ribosomes in prokaryotic cells were often stated as being 'smaller' rather than an actual size being given, although some candidates knew these were 70S or in the region of 10 – 20 nm. Many candidates were aware that a cell wall would always be present in prokaryotic cells.

In question 4(b)(i) 'cilium' or 'flagellum' were the most frequently seen answers, although 'microtubule', 'microfilament' and 'undulipodium' were also seen. Some candidates incorrectly stated 'centriole'.

Few candidates were able to gain 2 marks in question 4(b)(ii) with many just writing the name of a process such as 'mitosis', 'protein synthesis' or 'exocytosis'. These answers were considered to be too vague but many candidates gained credit for responses that described how the process involved the use of the cytoskeleton such as: 'mRNA moving from nucleus to ribosome', 'separation of chromosomes during cell division' or 'movement of vesicles through the cytoplasm'. These responses demonstrate a good understanding of the process.

Question 5

The sequence of stages in mitosis tested in question 5a was well known and the majority of candidates achieved full marks.

In question 5(b)(i) many candidates incorrectly wrote 'prophase' or 'DNA replication'. Of those that got close, many wrote 'growth' with no further qualification – examiners were looking for 'cell growth' distinguished from growth of the organism. A significant few wrote 'protein synthesis' and gained credit.

Most candidates achieved only one mark in question 5(b)(ii) by mentioning 'mutation'. Many then described genetic disorders, such as cystic fibrosis, or the effect of the mutation on the whole body. Few were able to follow the process through in small detailed steps to suggest that the daughter cells would not contain genetic information identical to the parent cell and therefore may not be able to produce a particular protein or work as normal.

Question 5(c) revealed a deep misunderstanding in a high proportion of candidates. Many candidates wrote that the cells produced by meiosis were genetically different as they were a combination of chromosomes from 2 parents. This confusion of meiosis with fertilisation is worrying, and centres should ensure that candidates appreciate the difference between meiosis and fertilisation. However, a good number of candidates were able to state that four cells are produced and that the cells produced by meiosis are haploid.

Teaching tip:

When candidates are provided with an insert it is to stimulate their responses. They rarely write on the insert and these do not need to be returned with the candidate scripts. Centres should keep the inserts as a teaching tool.

Question 6

Question six was felt to be one of the most straightforward questions on the paper testing recall and understanding. Many of the better candidates achieved good scores, however, it was felt that the quality of spelling and the use of technical terms was poor.

Question 6(a)(i) was well answered with most candidates correctly stating 'cardiac' or 'myogenic'. Some candidates wrote 'smooth muscle'. Candidates should be reminded not to write more than one answer as it is only the first answer on the line that is marked. Occasionally we saw answers like 'smooth cardiac' which is incorrect.

Question 6(a)(ii) also caused little difficulty but some candidates wrote 'cardiac cycle' and a few weaker candidates wrote 'diastole', clearly confusing this with systole and demonstrating that they were not sure which was the contraction and which the relaxation stage.

In question 6(b)(i) many candidates scored two marks for correctly calculating the heart rate as 75 beats per minute. The strongest candidates also showed clear working. It is important to remind candidates to show their working as there were some cases where an incorrect answer was given but the working may have gained a mark – however, many candidates did not show their working. Therefore, it was rare to see one mark awarded here – either candidates were correct or very wrong. It was also apparent that a number of candidates did not have a calculator with them.

Question 6(b)(ii) discriminated well between the strongest and weakest candidates. A small number of students simply described the events in the cardiac cycle without much reference to the specific stage identified in the question and, as a result, gained few marks. It is so important that candidates read the question and realise the importance of the bold statements, e.g. "**immediately after X**". The very best candidates who gained full marks were those who recognised this instruction and only described the events after X and included all the key information and **only** that information. The first marking point was rarely awarded as candidates made vague references to drops in pressure but did not describe the pressure in the ventricle being lower than in the atrium. This mark could have been gained simply by looking closely at the graph provided and describing what it showed. More candidates gained the second marking point by stating that 'the atrio-ventricular valve opens' (although sometimes the atrio-ventricular valves were confused with the semi-lunar valves). A larger number of candidates gained the third marking point by referring to blood flowing into the ventricle. However, weaker candidates clearly thought that the atrium was contracting and pushing the blood into the ventricles instead of it simply flowing in, and any reference to 'forced' or pushed' was not awarded.

Teaching tip:

This area of the specification is not covered in detail in all GCSE specifications, it therefore needs to be taught very thoroughly. Students should be able to describe the sequence of events occurring in the heart. Using card sort exercises can help candidates learn the correct sequence of events. Alternatively, a kinaesthetic approach in which one student takes paces forward only when given the correct step in the cardiac cycle by his/her classmates; the aim being to return to his/her seat or reach a specific point in the room.
A class exercise reading through questions and discussing the response would provide good practice at spotting the correct emphasis provided by emboldened words and understanding the relevant command word in the question.

F212 Molecules, Biodiversity, Food and Health

General Comments

This is the first time that this unit has been assessed and it has a different format and different proportions of assessment objectives to the AS units of the legacy specification. The most obvious difference is that this paper has 100 marks; but there is also a greater amount of extended writing and more emphasis on application of knowledge (AO2) and how science works (AO3) than previously. Candidates are expected to apply their knowledge to unfamiliar situations and will encounter specific questions addressing how science works. This means that, inevitably, there will be a smaller proportion of straightforward recall questions and candidates are expected to use the knowledge and skills that they have developed during the course in answering more open-ended questions.

Teaching tip:

A good way to prepare candidates is to teach as many topics as possible within context. It is useful to introduce a topic in a particular context and to then reference as many contexts or case studies as possible that would apply to that material. Candidates will then be more comfortable with encountering unfamiliar material and would be accustomed to looking at such information and identifying the knowledge that they need to deal with it.

In this session, candidates had a broad range of abilities, resulting in scripts that gained a wide range of marks. Some candidates struggled with basic scientific terminology, e.g. the meaning of reliability in Q6(b)(iii), and interpreting graphs in Q6(b)(i). Many lacked understanding of examination rubric and terminology, e.g. being unable to distinguish between 'describe' and 'explain'.

Some very good scripts were seen, indicating that those candidates were coping well with the slightly different emphasis in the method of assessment of this unit compared with the legacy AS units. However, some candidates experienced difficulty in answering specific and detailed questions about certain areas of the specification. An apparent lack of care in reading the question led to misinterpretation, resulting in some candidates relating correct facts but not relevant to the question that had been asked. This was particularly evident in Q2(b) and Q6(b)(ii). The facts supplied often showed good understanding of the subject area but did not address the question that had been set. A number of questions were not attempted by a significant proportion of candidates. The most significant of these was Q3(d), which was a question requiring straightforward recall of a learning outcome on the specification.

Teaching tip:

Encourage candidates to go into the examination with a pencil or highlighter. It is useful to highlight or underline a few key words in the question so that the focus of the question is indicated. It is also useful to highlight the command word in this way.

On this paper, as will also be the case for F215, the marks for the Quality of Written Communication may be awarded for one of a number of different criteria. The particular requirement for each question to which it applies (identified by the pencil icon) is indicated clearly in the rubric and candidates should use this to plan their answer. This is a change from the legacy specification.

Comments on Individual Questions

Question 1

Q1(a) was intended as a reasonably straightforward introduction to the paper. However some candidates were unable to score full marks here. The most common errors were to give 'parallel' as the second answer (rather than 'antiparallel'), 'polypeptide' for the third answer (rather than 'sugar-phosphate') and 'covalent' for the fourth answer (instead of 'hydrogen').

In Q1(b)(i), some candidates were too involved with describing minute details of the data rather than looking at the patterns. Some observations were repeated in a number of ways, without looking for different patterns. Candidates should be reminded to use units when quoting data. examiners were looking for the figures quoted as %. In Q1(ii), candidates were expected to link the information in Table 1.1 to how this would inform the deduction of the structure of DNA. Weaker responses did not refer to this information, just outlining the arrangements of bases in the structure of DNA. Others did not read the question and so did not refer to the structure of DNA but instead commented on evolutionary relationships.

Teaching tip:

As candidates will often be expected to comment on data presented in graphical and table form, it is a good idea to expose them to as many examples as possible. This is also a good opportunity to reinforce the difference between the command words 'describe' and 'explain'. Try supplying the students with the data alone and ask them to look for patterns and trends, to use the data to explain what is happening and, particularly if you use newspapers or other non-scientific sources, evaluate the way in which the data is presented. If they can become accustomed to doing this, then they can quickly look at and evaluate data and be prepared to answer most questions that might be asked about it.

Answers to Q1(c) were variable in quality. Most candidates were able to correctly state the number of strands in both nucleic acids. Many candidates recognised the replacement of thymine in DNA with uracil in RNA, but candidates should be reminded that spelling of nucleotide bases should be unambiguous, as there are a number of biological terms with which they can be confused. The sugar present in each nucleic acid was the least well stated difference. Some named the acid rather than the sugar, while others suggested a variety of sugars, such as pentose, hexose, sucrose and glucose. Some candidates had lost track of the fact that they were meant to be stating ways in which the structures are different and so indicated that four bases and sugars are present in each – i.e. ways in which the two were similar.

Most candidates were able to score at least one mark in Q1(d). There is, as there has been historically, confusion between the genetic code and polypeptide structure, with candidates making statements such as 'mRNA makes the amino acids and carries the chains of amino acids from the DNA in the nucleus to the ribosome'. A common mistake was to state or imply that the whole DNA code was copied. Candidates recognised the involvement of the ribosomes in protein synthesis. Some candidates gave excellent detail, even justifying the use of mRNA as 'DNA was too big to leave the nucleus, and contained too much other information which did not need reading'.

Question 2

In Q2(a), the main shortcoming in the responses was a lack of detail. Examiners were looking for the generic name in (i) and this was answered well by many candidates. Candidates were also expected to specifically state the female *Anopheles* in (ii). Despite being a learning outcome (2.2.2,c), a surprisingly high number of candidates did not attempt (i) (11%) or (ii) (9%). In (iii), as the term 'cell' had been given in the question, it was assumed that an answer of 'liver' referred to a liver cell rather than the organ (in another question on another occasion, particularly one which is distinguishing between tissue and organ, this might not be assumed and so candidates should become accustomed to stating 'cell' whenever appropriate). Most candidates provided a suitable answer here, although some simply stated 'blood cell' which was not precise enough.

Candidates find immunity difficult. In Q2(b), the main problems were a lack of precision in the answers and not reading the question carefully (so including many details of T lymphocytes that were not relevant to this answer). Few candidates discussed the humoral response or selection well, often vaguely discussing T-lymphocytes. Surprisingly, the specificity of antibodies was rarely explored by candidates. Given the fact that the requirement to make the sequence of events explicit was emphasised in the question, it was disappointing that most candidates' answers did not follow the sequence of events well. Responses that were written clearly in the correct order of selection, expansion and differentiation would be awarded the mark for the Quality of Written Communication. Muddled responses or those that omitted a stage did not score.

The common fault in Q2(c) was to be imprecise and to refer to 'disease' or 'malaria' when meaning 'pathogen' or '*Plasmodium*'. Here, as in Q2(d), it was evident that a significant number of candidates thought that the pathogen was a virus or a bacterium, otherwise biologically correct answers were unlikely to score full marks because of this. Many misunderstood the question and answered from the point of view of mutating strains or moving to another malarial area with different strains. Some candidates thought that memory cells eventually 'forgot'; some particularly weak candidates, who had not discussed memory cells in Q2(b), wrote about 'antibodies dying'.

Candidates were expected to combine their knowledge of vaccines and vaccinations with their knowledge of malaria and apply this to the question in Q2(d). Many found this particularly difficult. Again, references to the disease or malaria rather than the pathogen limited the number of marks available. While candidates appreciated that there were various strains of *Plasmodium*, a substantial proportion referred to 'strands', which was not credited. Some of the better responses referred to mutations and different antigens. Only the best responses gained marks for referring to different stages of the life cycle or the parasite being hidden inside cells.

Question 3

Q3(a)(i) was answered well by many candidates, with a large proportion scoring at least one mark. Some reversed the names, while others referred to covalent bonds rather than glycosidic. Examiners were looking for a correct spelling of glycosidic in order to prevent any confusion between this and any other biological terms. Most candidates correctly stated hydrolysis in Q3(ii), the most common error being to suggest condensation. Weaker candidates tended to muddle the two types of reaction, either stating condensation and describing hydrolysis or vice versa. Many candidates identified the final product as glucose, although fewer correctly stated β-glucose – as the original substrate was cellulose, Examiners were looking for the correct qualification in the responses to Q3(iii).

Most candidates made a good attempt in Q3(b), but some found it difficult to express their ideas carefully. The key point was specificity and candidates were expected to expand on this by referring to the different substrate shapes and complementary active sites. A large number of

candidates failed to score any marks as they missed the point and either wrote about the factors affecting enzyme activity in different regions of the digestive system or about different pH values (or other specified conditions) needing different enzymes.

There were many good and clear responses to Q3(c)(i). Weaker responses provided general information rather than linking their knowledge to the particular question. This was illustrated, for example, by references to 'if the pH is too high or too low'. The idea that pH 7 was 'more alkaline' was fairly common. Several candidates also thought that as the pH got higher the number of hydrogen ions increased. Bonds were often mentioned without the type being specified or candidates knew which bonds were involved but failed to mention that they were broken. It is pleasing to note that few candidates suggested that enzymes were killed but there were some vague references to active sites that did not refer to shape. Many candidates were able to suggest at least one correct factor in Q3(ii). Candidates should be reminded to use the term 'concentration' rather than 'amount' or other vague term.

Despite this being a clear learning outcome in the specification (2.1.1,s), many candidates had little idea of the procedure and a significant proportion (8%) did not even attempt Q3(d). Weaker responses failed to mention the colorimeter at all, meaning that the only marks that they could access were those referring to the conduction of the Benedict's test. This implies that many candidates had not had sufficient preparation. Better answers indicated that those candidates had either experienced using a colorimeter (either for a practical exercise of this type or in a different context) or had a good understanding of the principles of this particular procedure. It was not always clear that the filtrate should be tested in the colorimeter as some referred to the absorbance of the precipitate. Few thought about the use of known or standardised concentrations of glucose, plotting a calibration curve and then using it to read off the concentration of an unknown sugar solution.

Question 4

Q4(a)(i) was generally well answered, although examiners were looking for the definite idea of extinction rather than 'could' or 'might' become extinct. The calculation in Q4(a)(ii) was answered with varying success. Some candidates were unable to take the first step of determining that 1% could be obtained by dividing 4000 by 3. Various calculations were attempted that involved 97%. As the question referred to individuals, candidates were expected to give their answer to a whole number of vultures.

Teaching tip:

As candidates will be expected to perform calculations of various types, students should be given as much experience as possible in calculations involving percentages, magnification and manipulation of formulae (in line with the mathematical requirements of the specification) in addition to specific mathematical requirements as detailed in the learning outcomes.

In Q4(b)(i), despite the terms 'ex situ' and 'in situ' being explained in the question, a significant number of candidates confused the two. Although four marks were allocated to this question, candidates rarely made four distinct points, often repeating the different aspects of the same idea for both ex situ and in situ – i.e. making the same point twice. Answers to Q4(b)(ii) often lacked detail, even though the ideas presented would have had some merit if they had been further developed. Candidates were expected, for example, to refer to genetic variation rather than variation alone. Candidates must learn to distinguish between 'inbreeding' and 'interbreeding', which were often confused.

Many candidates were able to refer to general principles of conservation in Q4(c) and to apply them to this particular situation. As the question was set in the context of preventing the extinction of the white-backed vulture, this was not expected as one of the answers. Maintaining biodiversity, being part of the food chain and the right to existence were most often suggested.

In Q4(d), some good ideas were suggested but not always well expressed. However, this question proved relatively straightforward for many candidates with banning the painkiller, banning hunting of vultures and monitoring the vulture population as the most popular measures given.

Teaching tip:

This is a good area to provide as many contexts as possible, so that candidates are used to encountering different examples and learn to apply the relevant principles to a variety of situations. A resource file can be built up over time to illustrate various aspects of conservation and biodiversity – or students can be encouraged to search the internet or press to find as many different examples as they can, seeing how the measures taken are modified to suit each individual case.

Question 5

In Q5(a)(i), the vast majority of candidates correctly identified the nucleus as the relevant feature. A few gave more than one answer and therefore failed to gain the mark. Responses to Q5(a)(ii) were varied. Candidates were expected to qualify the wall as chitinous and digestion as extracellular or external. Many, however, stated the presence of spores and hyphae, which avoided such problems. A few more able candidates included multi-nucleate. Answers to Q5(a)(iii) were generally better, although candidates needed to qualify the cell wall as being made of cellulose to distinguish it from the fungal wall. The most common answers were that plants have chloroplasts and therefore carry out photosynthesis. A few weaker candidates referred to "producing" energy by photosynthesis which was not credited. Q5(a)(iv) was answered well, although some weaker responses referred to eukaryotes or another taxonomic group instead of Protoctista. Spelling of ‘Protoctista’ was expected to be unambiguous, so many of the variants were not credited.

Q5(b)(i) was answered well by few candidates. Despite being a direct learning outcome for this unit (2.3.3c), candidates did not appear to recognise the discrete nature of discontinuous variation. A significant proportion of candidates (11%) did not attempt the question. Some, however, went on to correctly state a characteristic of this type of variation, having provided an incorrect answer on the ‘type’ prompt line. Few candidates mentioned more than the idea of definite categories without intermediate values and so very few gained more than two marks. In Q5b(ii), candidates generally had an idea of the procedure – although some concentrated on forms of genetic engineering or taking cuttings or grafting, none of which answered the question. The common fault in answers to this question was a lack of clarity – it was not always clear which plants were being bred together and even if they were crossed at all – they were often ‘grown together’. Candidates should make it clear that the offspring that have the desirable characteristics are the ones that are selected and interbred, as this was not the case in many of the accounts. Although many candidates appreciated that this breeding programme would take time, they often referred to ‘repeating the process’ without stating whether they meant the selection and interbreeding of the offspring or the original cross. The selection and interbreeding of the offspring over many generations would be a far better way of expressing this idea.

Answers to Q5(c) also needed a little more clarity. Candidates find this concept difficult to express and it is important to stress that the variation occurs independently of the selection

agent. Many accounts either stated or implied that the fungus was changing in response to the resistance exhibited by the wheat rather than those individuals who happened to have a mechanism to overcome the resistance being in a position to be more successful. It was rare to see the scientific language and terminology that is usually required at AS level. Examiners are expecting reference to alleles (or even genes) rather than 'characteristics' or 'abilities' to be passed on to future generations. Only rarely did candidates give a valid statement on how the allele frequency in the mildew population would change. There was also little mention of the wheat resistance acting as a selection pressure or the reproductive capacity of the mildew which would allow the mutation to spread quickly through the population.

Teaching tip:

As this is one of the topics that candidates find difficult to express clearly, it could be an opportunity for students to present information to the rest of the group, concentrating on the sequence and terminology. The other students should be encouraged to comment critically and constructively so that the correctly expressed explanation is arrived at.

Question 6

Many candidates scored reasonably well in Q6(a)(i). It was clear, however, that some candidates launched into an account of the effects of smoking on the gas exchange system without having taken enough account of the context of the question – which was emphysema. Consequently, references to cancer and chronic bronchitis were frequently seen. Some accounts were clear and comprehensive while others lacked detail such as the destruction of elastic fibres or elastin, simply stating that elasticity was lost. Almost all candidates referred to coughing as a sign or symptom of emphysema in Q6(ii). It was considered that, once someone had emphysema, they would find it so difficult to breathe out that coughing would be even more difficult. Many imprecise statements relating to breathing were seen, and only those that gave some sort of indication of difficulty in breathing out or shortness of breath were credited. A statement such as 'difficulty in breathing' or 'heavy breathing' was not credited. Few candidates emphasised the idea of fatigue, tending simply to refer to becoming tired when exercising – it was felt that this was not precise enough as this would apply to any unfit person. Few candidates scored more than one mark here. Many candidates, in Q6(iii), appreciated that a chronic condition was long-term and some went on to refer to becoming progressively worse; although, again, few scored more than one mark.

In Q6(b)(i**)**, candidates generally made a reasonable attempt at describing the data. Candidates should be encouraged to look for patterns and trends in data rather than itemising each individual change. This was particularly relevant when considering the data for the smoker after the age of 15/16. After this age, there is a downward trend; but most candidates dealt with each individual point and so lost the overview of what was happening. Some identified the result at 17 as anomalous. When quoting data, candidates should refer to both axes – in this case either providing two separate data quotes (or a calculated difference) at the same stated age for the non-smoker and the smoker or two separate data quotes (or a calculated difference) at different stated ages for either the non-smoker or the smoker. Data quotes should include units, where appropriate, and should be accurate. Many incorrect figures were seen. Answers to Q6(b)(ii) were not so good, with many candidates simply describing the results rather than providing an explanation. Few recognised that the lungs would grow as the individual's age increased. It was rare to see a suitable explanation for the anomalous result at 17, as most candidates either suggested that it was due to a change in smoking pattern or development and recovery from emphysema. Candidates needed to select the relevant information that explains a reduced peak flow rate (i.e. lack of recoil or reduction in diameter of the airways) rather than general statements such as the reduced surface area of the alveoli. While some candidates suggested

three valid improvements in Q6(b)(iii), weaker answers were either too vague or gave suggestions that extended the investigation rather than looking for ways to improve the reliability. It was not uncommon to see references to ‘take into account’ a particular factor rather than stating that or describing how it needed to be controlled.

F213 Practical Skills in Biology 1

General Comments

The first session of practical tasks for F213 of the new specification went well overall. The moderating team were appreciative of those many centres that responded promptly to all requests and had organised the work correctly. Additionally, a large number of centres had correctly used the mark schemes and marked the scripts using the appropriate conventions. This advice can be found at the front of the tasks and in the Practical Skills Handbook.

Some centres seemed to be well informed of the changes associated with the new specifications and had prepared their students well, whilst other centres and their candidates were less well prepared. This difference seemed to be linked to attendance at INSET. Centres are to be encouraged to make use of the INSET provision to keep informed of the changes. Details of changes to tasks and mark schemes are available on Interchange, as are updates on any changes to the tasks post-publication.

There was evidence that some centres downloaded the task at the start of the year and did not subsequently check for modifications and changes. OCR provides an email update alert service to which all centres are encouraged to subscribe, which will alert centres that modifications have been made in the light of implementing tasks.

Centres are also encouraged to submit marks for the coursework tasks on Interchange rather than by paper MS1. A copy of the electronic mark sheet can be taken for the moderator and for the centre to retain.

There were concerns that an increasing number of centres submitted their marks late; this not only delays the moderation process but may delay the publication of results in August. Other centres delayed returning requested samples or responding slowly to queries from the moderator. These requests are sent via the email address provided by the centre so we ask all centres to ensure the correct email address is provided and for it to be checked frequently prior to and during the exam session.

Another concern was the increased number of centres with clerical errors. This was not necessarily incorrect addition of the three tasks but in many cases, was incorrect addition within the task. Centres are advised to use a clerical checker during internal moderation to avoid this and avoid unnecessary delays in publication of results in August. OCR provides a spread sheet on Interchange for centres to input all task marks for their candidates. This automatically selects the best mark for each task for candidates and adds them to give the final total out of 40. A copy of this should be sent to the moderator with the selected sample and other paperwork.

Centres are reminded the final mark, out of 40, is created from one qualitative, one quantitative and one evaluative task. Only the three tasks selected in compiling the final mark should be submitted for each candidate. These should be loosely tied together with long treasury tags to allow pages to be turned easily without the loss of any pages. Folders and wallets are to be discouraged.

Tasks should be annotated with a tick for each mark given preferably at the point of awarding the mark. Additional comments should be made where professional judgements have been used. This allows the moderator the opportunity to understand and try to reach an agreement with the centres marks. The mark schemes for each task include additional guidance which indicates the range of responses allowed as well as providing advice on using professional judgements. When using professional judgement, it is important to consider the phrasing of the

question and to look carefully to see whether the information given is not only biologically correct but also answers the question that has been set.
Centre number, candidate numbers and date assessed must be provided on the front cover of each task for each candidate.

If candidates wish to resubmit any of the tasks (2008-2009) in the next examination session (i.e. 2009-2010), it is important that centres remark the work in the light of moderator's comments and any changes or modifications in the original mark scheme are implemented. Up to two tasks may be resubmitted by a candidate in a subsequent session, providing the work has been remarked.

Comments on the tasks

The qualitative tasks were intended to be the easiest of the three task types. However, many candidates found it difficult to record their observations to the level of precision and detail required in the paper. Tabulation of data was also not well understood by many candidates with incorrect recording of their data or drawing incorrect tables. Centres could use this as a training opportunity early in the course. If centres have access to their students in the period after the GCSE examinations, these skills could be usefully covered at this time.

The quantitative tasks involved some simple mathematical calculations, which did challenge some candidates. Many seemed not to understand the idea of precision or recording data to the correct number of decimal places or significant figures. Please note it is the centre's responsibility to check all calculations for candidates and mark the candidate's work accordingly, as these will be checked by the moderator. Graphs were also a difficult area for some candidates; with a lack of knowledge on how to correctly scale the axes, label axes and use correct units. Both calculations and graphs could be used in training sessions. Conversely, it was pleasing to see the number of candidates able to demonstrate their biological knowledge correctly in response to questions in both the qualitative and the quantitative tasks.

In the evaluative tasks, many candidates failed to produce the correct responses to questions on limitations, accuracy and reliability. These terms still seem to be misunderstood by a large body of students and centres are advised to ensure these terms are understood. Again, there were a large number able to demonstrate good biological understanding by making appropriate responses to questions in the evaluative tasks which was pleasing to note.

Teachers should be aware that each task is accompanied with a set of teacher and technician instructions which indicate the range of modifications possible without seeking approval from OCR; for example, this may cover the range of suitable plant species for a particular task. All centres are urged to read these instructions carefully. Photos and prepared slides should **not** be used in place of live material.

Grade Thresholds

Advanced Subsidiary GCE (Biology) (H021)
June 2009 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A	B	C	D	E	U
F211	Raw	60	42	37	33	29	25	0
	UMS	90	72	63	54	45	36	0
F212	Raw	100	66	59	52	45	38	0
	UMS	150	120	105	90	75	60	0
F213	Raw	40	33	30	27	25	23	0
	UMS	60	48	42	36	30	24	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
H021	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
H021	16.0	30.8	47.4	64.9	80.0	100.0	20698

20698 candidates aggregated this series

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

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