GCE

Biology

Advanced GCE **A2 H421**

Advanced Subsidiary GCE **AS H021**

OCR Report to Centres June 2015

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Advanced GCE Biology (H421)

Advanced Subsidiary GCE Biology (H021)

OCR REPORT TO CENTRES

F211 Cells, Exchange and Transport

General Comments:

This examination paper was felt to be straightforward and of an appropriate level of difficulty. It generated marks across the ability range and the majority of candidates were able to provide responses to all parts. There were a few questions that required written descriptions or explanations and many candidates were able to show their knowledge by writing lengthy responses. One general point which applies to all questions and to those in other units is thatcandidates should be reminded that when they have used all the writing space provided they should then use the additional pages at the end of the examination paper to continue their response. The continuation should be clearly numbered so that examiners know which question it refers to. Another point that will be referred to later is that many candidates lose marks because of the way they have revised. Learning the mark scheme for previous examinations helps to answer the questions in previous examinations – it does not always help the candidate to think about the specific question being asked. All too often candidates read a question quickly and think they recognise it from a previous session. This leads to responses that are not specifically tuned to the question.

Comments on Individual Questions:

Question No. 1

Q.1(a)(i) As an easy starter question candidates were asked to name the pores through which water vapour was lost from a leaf. Most students gave the expected response: 'stomata'. However, a few had obviously misread the question as 'name the process' and gave the response: 'transpiration'.

Q.1(a)(ii) Many candidates knew that the guard cells are adapted by having walls that were unevenly thickened so that the cell will bend when it becomes turgid. Some candidates referred to the cells expanding or swelling without a reference to a change of shape; this was not felt to be sufficient for credit to be awarded. Some candidates also gained credit for the fact that these cells use energy and therefore need organelles that can release ATP – although the majority of these candidates suggested that many mitochondria were present rather than chloroplasts. A small minority also gave the higher level response that the plasma membrane contains some form of transport proteins that pump ions into or out of the cell to cause changes in turgidity. Many weaker responses focussed on the function of the guard cells by describing how an increase in turgidity causes the stoma to open. These responses suggest that the question had not been read and interpreted correctly. Centres should ensure that all candidates are aware that adaptations may be structural or physiological and enable processes to occur.

Q.1(a)(iii) Examiners were hoping to see the response 'epidermis' or 'waxy cuticle' and were pleased that a good proportion of candidates gave this response. However, Examiners were surprised at how often responses such as 'roots' or 'root hair cells' appeared. Many candidates stated that water is lost from the leaf via 'the mesophyll' or 'spongy mesophyll cells' – however, these are part of the pathway that leads to loss from the stomata and gained no credit. Weaker responses included 'surface' or 'photosynthesis' which were not considered to be a named part of the leaf.

Q.1(b) Examiners are often surprised at how well this type of 'cloze' question manages to differentiate between candidates at this level. The expected responses were: 'water potential', 'osmosis', 'selectively permeable' and 'turgidity'. Many candidates managed three marks but

only the best achieved all four. The last space, requiring the term 'turgidity', was the most frequently completed incorrectly. Examples of responses given for the fourth gap included: 'volume', 'strength', 'rigidity' and 'shape'.

Q.1(c) This question attempted to separate out one specific theory used to explain how water is moved up the xylem from the other theories. Examiners hoped to see responses that described evaporation of water at the leaves causing tension in the xylem which could pull a column of cohesive water molecules up the plant. Concise, relevant responses were rare. Many candidates did not read the question carefully or simply chose to write everything they had learned about the transport of water through a plant. Many candidates were unable to separate the cohesion-tension theory from other ideas and their responses included lots of unnecessary detail about how water enters at the roots and moves across the root to the xylem or about how root pressure is created. Cohesion between water molecules was well understood but the role of tension was less well appreciated. Many responses confused the effect of water loss creating tension with a gradient in the hydrostatic pressure up the stem. Statements such as 'water vapour is lost from the aerial parts of the plant via transpiration' occurred frequently, which suggests that students have learned ideal answers from previous exams and are simply regurgitating them without considering the specific question asked. Some candidates confused adhesion and cohesion.

Question No. 2

Overall, this question was one of the most straightforward in the paper, expecting candidates to simply recall their knowledge. Errors were made either because students had not revised the content sufficiently well, or through phrasing their responses incorrectly.

Q.2(a) This was generally well answered by candidates, especially rows 1 and 2 where the majority of candidates identified budding as the means of cell division and that all except the bacterium possess a nucleus. However, a significant number of candidates suggested cytokinesis, binary fission or mitosis as the means of cell division. Rows 3 and 4 were less well answered. The material in the cell wall of plant cells (cellulose) was well known, but only the best candidates knew peptidoglycan and how to spell this term correctly. Some guessed at cellulose, polysaccharide and chitin or left the space blank. The most common mistake in row 4 was to suggest that either yeast or bacterium had no ribosomes.

Q.2(b)(i) This was well answered with the majority of candidates giving the correct response (meristem). The most common error was to name the sites in the plant where meristematic tissue is found (root tip or shoot tip) or stating 'cambium'.

Q.2(b)(ii) A good proportion of candidates gained full credit for stating 'nucleus' and 'cytoplasm'. Some correctly described 'no end walls'. The most common misconceptions were 'vacuole' and 'other organelles' or naming specific organelles such as 'mitochondria' – none of these features are visible in the photograph supplied. There was a feeling that many less able candidates were simply listing differences from memory rather than referring to the photographs.

Q.2(b)(iii) Many candidates correctly stated that xylem vessel walls are 'impregnated with lignin' or some variation of this. However some failed to achieve credit because of poor expression - stating that lignin 'lined' or 'coated' the cell walls. Many candidates also correctly identified the pits in the walls of mature xylem vessels, although a few erroneously referred to these as 'pores' or 'plasmodsemata'. Only a very few candidates stated that the walls would be thicker. Unfortunately, a number of less able candidates lost marks because they described the adaptations of xylem tissue forming hollow tubes or referred to a lack of end walls between the cells rather than referring to the structure of the wall itself.

Q.2(c) Was generally well answered with at least one marking point achieved by most candidates, usually for 'companion cells'. The common error was not giving the correct full name of the sieve tube elements – many candidates wrote simply 'sieve tubes' or 'sieve cells'

Question No. 3

Q.3(a)(i) Candidates were asked to name two types of epithelial tissue found in the lungs and airways. The most common responses were 'squamous' and 'ciliated' and the majority of candidates scored both marks. The most common incorrect response was to write 'ciliated' and 'goblet'.

Q3(a)(ii) Candidates were asked to explain how the alveoli create a surface for efficient gaseous exchange. To award a mark Examiners were looking for the description of a feature accompanied by an explanation of how this feature improves gaseous exchange. For example, 'alveoli have a wall that is one cell thick' needed to be combined with 'to create a short diffusion pathway' in order to achieve a mark. This question differentiated well as there were good responses from those who really understood the significance of the question and planned their points carefully to gain full credit. However, many responses displayed evidence of rote learning with full descriptions of the features that make a good exchange surface that were not accompanied by an explanation of how this improved exchange. It was clear that many candidates still do not fully understand the concepts of surface area and surface area to volume ratio. Many candidates thought it enough to say 'Alveoli have a big surface area' without any mention of the presence of many alveoli. Many candidates simply stated that 'alveoli have a large surface area to volume ratio' without mentioning that this is achieved because they are so small. Some candidates simply used the two terms in the same sentence as if they are synonymous.

Many candidates wrote detailed descriptions of the capillary network despite the question being specific to alveoli. There is still a widespread belief that gas exchange surfaces must be moist to allow efficient diffusion, with the gases needing to dissolve in water before they can diffuse. Candidates should be aware that gases such as oxygen and carbon dioxide can dissolve in the phospholipid bilayer and diffuse across without first dissolving in water. The mark for use of terms was usually awarded as most candidates referred to '*surface area'* and '*diffusion'*. However, these terms were occasionally used in the wrong context such as referring to 'small alveoli have a large surface area'.

Q.3(b)(i) Candidates were asked to name the apparatus used to record air movements created by ventilation. The majority gave the correct answer 'spirometer' but incorrect responses included 'potometer', 'oxygen chamber', 'ventilator' and even 'apparatus to record air movements'.

Q.3(b)(ii) The majority of candidates were able to count the number of peaks or troughs on the trace to state the rate of breathing correctly as 13 (measured by counting peaks) or 14 (measured by counting troughs). 13.5 was also accepted as the most accurate response.

Q.3(b)(iii) Candidates were asked to calculate the rate of oxygen consumption over the first minute from the trace. Surprisingly few candidates were able to give the correct answer (0.5) to this simple calculation. The calculation required the subtraction of one value from another, both identified from the trace. Candidates could measure from the peaks (3.6 – 3.1) or from the troughs (2.7 – 2.2) to gain the correct answer. Many of those who failed to score a mark measured from the first peak to the last trough (3.6 - 2.2 = 1.4). A number of candidates either left the space blank or wrote a wide range of inaccurate figures in the space provided. With the emphasis on mathematics in science becoming increasingly important it is essential that Centres put greater emphasis on this type of topic.
Question No. 4

The level of difficulty in this question was generally considered to be appropriate and candidates performed well – particularly in parts 4(a) and 4(b)(iii) where the main assessment objective was AO1. However, where the knowledge had to be applied in an unfamiliar context candidates performed less well.

Q.4(a) The majority of candidates had a fairly good idea of the structure of the plasma membrane but it was obvious that many had not read the question or fully understood what was required. Many candidates churned out a rote-learned response about the functions of the components of the membrane without actually describing in detail the structure of the membrane – ie: how the positions of the various components actually relate to one another. Some candidates used diagrams but these were generally poorly annotated, if at all, and so gained little credit. Almost all candidates gained credit for noting that the phospholipids are found in a bilayer which also contains proteins. More able candidates correctly used the terms hydrophobic and hydrophilic in reference to the parts of the phospholipids but often failed to correctly describe their orientation in the membrane. Quite a few candidates used the terms intrinsic and extrinsic in reference to proteins but those attempting to describe the position of the proteins in the membrane often gave muddled answers and failed to gain credit. This was often confused by attempts to give the functions of the proteins which were not required. Many candidates discussed the functions of cholesterol, glycoproteins and glycolipids but again failed to fully describe their position in the membrane structure.

Q.4(b)(i) It was important that candidates read and understood the information given in the question. The majority of candidates gave the answer 'facilitated diffusion'. However, since the liquid portion of the solution was colourless after centrifugation all the indicator must have entered the cells. Therefore, the only correct response must be active transport. Those candidates who realised it was active transport also achieved the second point.

Q.4(b)(ii) Many candidates referred to the membrane being 'partially permeable' or 'selectively permeable' which is correct, but does not fully answer the question. Since the test refers to ammonia solution the student can only conclude something about the permeability to ammonia or ammonium ions. Only the most able candidates gave the correct response – that the membrane is impermeable to ammonia or ammonium ions.

Q.4(b)(iii) Most candidates have a good idea about the effects of high temperature on the structure of the membrane, however, marks were often lost as a result of imprecise wording of the responses. Many candidates appreciated that increasing the temperature increases the kinetic energy but this was often described in ways that brought to mind membranes being thrown into wave patterns that become so large that the membrane is eventually broken apart. More able candidates knew that it is the kinetic energy of individual molecules that is increased and as the phospholipids move about more at random this creates gaps in the membrane. Candidates also knew that proteins are denatured by excessive temperatures but many only referred to enzymes, perhaps forgetting that the question was about the effect of high temperature on a cell membrane and not an enzyme controlled reaction. In addition, there were numerous references to changes in the properties of the membrane such as 'the membrane becomes leaky' with no further qualification about changes to the structure of the membrane.

Question No. 5

This proved to be the most discriminating question on the paper.

Q.5(a) This question received a good spread of marks – many candidates achieved full credit but a range of 1 and 2 mark responses was also seen. However, no clear pattern of alternative responses could be identified.

Q.5(b)(i) The majority of candidates appreciated that supraventricular tachycardia would cause two QRS peaks to show on the ECG. Some responses were very carefully drawn while others were quick sketches. However, most candidates drew a second QRS peak after the normal peak leaving a gap between the P wave and the first QRS peak. Only a relatively small number realised that the additional QRS peak would occur immediately after the P wave and that there should be no gap between the P and the first QRS. In fact the P and the first QRS complex tend to merge into one.

Q.5(b)(ii) This proved to be another challenging question in which more than half the candidates incorrectly stated that blood flow or blood pressure would increase due to a double ventricular systole. Candidates needed a very secure understanding of the cardiac cycle to appreciate that if the ventricle contracts too soon it will not have allowed time for the atria to empty into the ventricles, therefore the volume of blood in the ventricle would be lower than normal. Examiners were very pleased to see that the best candidates fully appreciated that not only would the ventricles not fill properly but the first contraction would start at the top of the ventricles pushing blood down away from the major arteries.
Many candidates wrote about pressure and/or rate of flow or suggested that the flow would be more irregular. A typical incorrect answer would be "It may increase the blood pressure as ventricular systole occurs twice, for every atrial systole. This would pump blood faster around the body".

Q.5(c)(i) Examiners were looking for definite statements about the flow of blood in the fetus such as 'less blood flows to the lungs' or 'the pulmonary circuit is by-passed'. Many candidates were rather vague making statements such as 'no need for blood to flow to the lungs' or 'the fetus gets oxygen from its mother' without mention of haemoglobin or the placenta. Other common mistakes included references to mother and fetus sharing blood, or that 'the fetus doesn't respire so there is no deoxygenated blood'! Many candidates answered this question carelessly because they did not recognise that the placenta is the only source of oxygen for the fetus. A large number of candidates did not discuss the lungs at all in their response, not appreciating that the fetus cannot breathe in utero. Instead they made statements such as 'the heart is not developed enough to pump blood' or more worryingly 'the mother pumps blood around their body so they don't have to'.

Q5(c)(ii). The majority of candidates knew that fetal haemoglobin has a higher affinity for oxygen than adult haemoglobin. Those who did not achieve this mark stated that fetal haemoglobin had 'a high affinity' or failed to make it clear that it was the affinity for oxygen. Fewer candidates achieved the second mark where examiners were looking for a clear explanation of the reason for this difference using correct technical terminology.

Question No. 6

6(a)
smooth endoplasmic reticulum
The majority of candidates were able to state a function of smooth endoplasmic reticulum, usually referring to synthesis of lipids. A number of responses incorrectly made reference to proteins being associated with this organelle.

lysosome

The lysosome function was well known. The commonest errors stated that it produced enzymes or that the lysosome engulfed material during phagocytosis.

Ribosomes

Protein synthesis was usually correctly stated as the function of ribosomes. A few candidates gave accounts that confused the role of ribosomes with the role of mRNA.

6(b)
Candidates were asked to select the statements that could be used as evidence for the endosymbiotic theory. Many able candidates correctly selected the features which highlighted the similarities between the organelles and free-living bacteria. These included the similarities in overall size, type of ribosomes and the circular organisation of DNA. However, it was quite common for candidates to select the exact opposite of the 3 correct answers. This was either a misinterpretation of the question or, more likely, that weaker candidates simply ticked the boxes opposite the statements they knew to be correct statements.

F212 Molecules, Biodiversity, Food and Health

General Comments:

The paper gave a good spread of marks and the vast majority of candidates attempted all questions with no suggestion that candidates had struggled to finish the paper. Candidates who were well-prepared were able to gain marks across the range of topics covered. There were few instances of candidates misinterpreting what was required by each question. The most common misinterpretation was for candidates to discuss *how* or *what* to sample in question 3(b)(i), rather than why it is important *to* sample.

The correct use of technical terms was evident in the responses from many candidates, even in the environment based questions, suggesting that many Centres have taken on board advice from previous reports. The use of examples of particular species in questions often confuses candidates and it is clear that a very many candidates have very little 'wider' biological knowledge. While not required by the specification, it makes application of knowledge in unfamiliar contexts easier if candidates have encountered a variety of unfamiliar contexts before they sit the examination. Many candidates thought that roe deer might eat birds (despite being told they did not) and suggested that a herbivore that found itself with few plants to eat, might begin to dabble in carnivory. Phylogeny was also poorly understood as was, surprisingly, selective breeding of plants.

Practical analysis was generally better, but many candidates struggled with the meaning of 'validity'. This year there was less use of the vague word 'amount' and many candidates recognised that a more precise term should be used in question 1(c)(i). However, many candidates struggled with the data handling question, 4a. It is worth noting that such mathematical processing skills are likely to be more important in the new specifications.

Comments on Individual Questions:

Question No. 1

(a) (i) The vast majority of candidates got this mark; of those who did not 'polypeptide', 'dipeptide' and 'hydrogen' were the most common responses.

(ii) This was also a high scoring question with over three-quarters of candidates getting both marks. Some described condensation in some detail, for no marks or mixed up hydrolysis and condensation and got one mark only.

(b) Candidates generally showed a good understanding of enzyme action with students frequently using correct terminology; for example, most students appreciated the need to use the term 'active site' rather than 'enzyme'. The question discriminated well and the full range of marks was seen. A few candidates were confused about the position of the active site and those that thought it was on the substrate were not able to access the first two marking points. A number of candidates were not awarded the final marking point because they stated that the 'substrate' left the active site, showing a lack of understanding of the meaning of the term 'substrate'.

(c) (i) Most got 2 or 3 marks, appreciating the need to not use the word 'amount' and the lack of units for the egg white although a number of students used the word 'measurements' in place of 'units', which A-level students should not be doing. Many candidates correctly identified 'm' as the wrong unit for time – 'm' means

'metres'. However, a large number of these candidates thought 'm' stood for minutes and, where their answers implied that 'm' was the correct unit for minutes, their response was not credited. Candidates should be aware of the correct abbreviations for common units. Some answers referred to problems with the method or the way in which numbers had been entered into the table, misunderstanding the reference to 'preparation of the table' in the question.

(c)   (ii)   Less than 5% of candidates were awarded this mark. Common responses were 'increase the range of pH' or 'do repeats'. It was evident that understanding of the term 'validity' was poor. Disappointingly, some candidates cited unequal volumes as a problem in part (i) and then failed to mention it in part (ii).

(c)   (iii)   The vast majority of candidates got this mark. Although understanding of the term was not always clear, as evidenced by the small number of candidates who answered 'control variable'.

(c)   (iv)   Most candidates put both 'reliable' and 'identify anomalies' and most correctly used the word reliable and, in contrast to part (ii), did not confuse it with 'accurate' or 'valid'. Many candidates are uncertain about mean or average and so put both down. The second marking point was rarely seen. Some candidates thought it was reasonable simply to disregard anomalies, a statement for which they received no credit.

(d)   (i)   Most candidates knew that an inhibitor would produce a line below that drawn on the graph but a disappointing number were confused about competitive and non-competitive inhibitors and showed the line levelling off well below the original.

(d)   (ii)   This question discriminated well and showed a range of understanding of inhibition. The most common incorrect response, seen in a lot of scripts, was 'similar shape to pepsin' – perhaps not understanding that pepsin was the enzyme.

Question No. 2

(a)   (i)   This was often well answered with a well-rehearsed definition. Most candidates got 2 or 3 marks. Less good responses discussed living *off* a host rather than in or on. Some candidates were not clear that parasites always cause some degree of harm and statements like 'sometimes cause harm' were not credited. Vagueness often costs marks in definitions questions. A small minority thought the question was directed just at *Plasmodium* or thought all parasites were viruses or intracellular.

(a)   (ii)   Most candidates mentioned the role of *Anopheles* in penetrating the skin but far fewer mentioned that it did this in order to feed on blood. A few candidates thought that *Plasmodium* itself penetrated the skin. A small minority of responses were too general and discussed primary defences without ever mentioning the skin. There were some candidates who thought malaria was transmitted by infected needles or droplets.

(a)   (iii)   Most responses correctly linked temperature or humidity to the ability of mosquitoes to survive, although some referred to the climate being more suitable for the *Plasmodium* and did not get the mark. Responses that added nothing to the stem of the question were not credited.

(a)   (iv)   Most candidates achieved one mark for this question, usually for an explanation about the implications of global warming on the range of *Anopheles* mosquitoes.

Travel was commonly mentioned but not always qualified by 'more' or 'easier'. The idea of resistance was seen in some responses but was often not credited because of reference to antibiotics, vaccination or immunity. Examiners were surprised that, despite the apparent accessibility of the marks, very few candidates offered *two* reasons, even though they were told to give two reasons in the question.

(b) (i) This question differentiated well with B being the least common correct response. Many candidates identified B as 'phagocyte' or 'membrane', not appreciating the significance of the line extending beyond the membrane. D was sometimes identified as vesicle or vacuole rather than being qualified further.

(ii) This was a very challenging question. Less than one in twenty achieved a mark. A similar number of candidates had the right idea and mentioned cell signalling in some form but did not link this to chemicals and so could not be credited. Most candidates discussed antigen presentation, being unaware that this complex process could not be carried out by erythrocytes.

(c) This question differentiated well between candidates and many scored highly. Observations on each marking point were as follows:
- G1: Some candidates described the shape of globular proteins as 'round' and were not credited.
- G2: Some referred to hydrophobic and hydrophilic 'interactions' rather than parts of the molecule.
- G3: Almost nobody mentioned forming H-bonds with water.
- G4 and F3: These were very commonly awarded but a few candidates got the solubility the wrong way round.
- G5: This was only seen occasionally with enzymes being the most common suggestion.
- H1: This was regularly given but some candidates just mentioned 'binding' to oxygen, rather than transporting or carrying it.
- H2: This was frequently given but some responses just mentioned 'iron'.
- H3: This was rarely given. Candidates often discussed primary, secondary, tertiary and quaternary structures for both proteins.
- F1: This was given often for both 'long' and 'rope like'.
- F2 and C2: F2 was easier, and given slightly more often, but it was clear that many candidates had not learned the specific nature of the bonds within collagen.
- F4 and F5: Around half of candidates got both of got these marks.
- C1: Many candidates acknowledged that glycine formed a high proportion of the structure, but failed to link this to the chains being able to lie closely together.
- C3: This was attempted by a minority of candidates but with regard to strength rather than avoiding weak points.
- C4: Many candidates just repeated what was in the question, giving blood vessels as an example. Of those that were awarded the mark, 'tendons' was most frequent, followed by 'bone' and 'skin'.
- QWC: This was often awarded and where it wasn't it was usually for want of a C mark.

Many candidates stated that haemoglobin was made of α and β glucose. It is worth noting that such errors as this usually result in fewer marks for candidates. On this occasion the mark scheme was more forgiving.

Question No. 3

(a)   The majority of candidates answered this question correctly. The most common incorrect answers referred only to an increase in population or numbers.

(b)   (i)   This question differentiated well. Many candidates attained 1 mark for using the term 'representative', with fewer using 'estimate'. The most frequently seen full mark responses combined 'representative' or 'estimate' with the idea that sampling was more time-efficient. A significant minority of candidates were awarded no marks and of these, most appeared either to be describing *how* sampling should be carried out, or why measuring biodiversity was important.

        (ii)   The majority of candidates gained 1 mark for expressing the idea of comparing an area where roe deer could go with an area where roe deer could not go. Answers which suggested that the candidate was unaware of the purpose of the fence were not awarded marks.

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        (iii)   Few candidates gained all 3 marks but many gained the first 2. Most candidates could describe species richness and more candidates than in previous sessions were able to offer reasonable definitions of species evenness. Incorrect answers often referred only to one species or to the distribution of species. Marking points 3 and 4 were gained by only a few candidates and this question was a good discriminator.

                Some candidates simply wrote out the formula for Simpson's Index and were not awarded a mark.

        (iv)   This was generally well answered. Candidates either made the connection with food chains or realised that the shrubs might provide some form of habitat for the birds. Common incorrect responses usually fell into two categories. Either candidates suggested that bird ate the shrubs, which was a mis-reading of the question, or candidates suggested that the birds would be frightened by or even preyed upon by the deer.

        (v)   This question also discriminated well. Some candidates gained both marks, some got only one. Some candidates had the right idea but failed to gain a mark because they used an incorrect ecological term, for example, many candidates seemed to be using the terms 'population' or 'species' to mean 'ecosystem' or 'community', or the terms 'area' or 'environment' to mean 'habitat' or 'ecosystem'.

(c)   (i)   The vast majority of candidates were able to access this mark with little problem. The minority who did not gain the mark discussed the lynx out-competing the native species or bringing disease into the country.

        (ii)   Candidates found this question challenging and it discriminated well between candidates of different abilities. Many students had learnt the definition of phylogeny and gained the first marking point. Definitions that failed to get a mark usually failed to mention evolution or species. Few candidates stated that phylogeny was the basis of classification with sufficient weight or clarity to gain a mark. A minority of candidates were able to gain ab mark by stating that certain biomolecules were used in classification as an indicator of phylogeny. The general marking point 4 was awarded even less often than the more specific marking point 5. Candidates tended to simply re-iterate the stem of the question without mentioning the lynx's phylogeny. Some candidates had the idea of marking point 5 but failed to use the term either species or genus and so could not be awarded the mark.

(iii)   Most candidates gained the mark for new/better technology or reference to biochemical evidence. The most disappointing wrong answer, seen quite frequently, was that the lynx had recently evolved into a new species over a 10 year period.

(iv)   The vast majority of candidates gained at least 2 marks on this sub-question and many scored all 3. A variety of answers were allowed and the candidates offered a range of, often ingenious, valid responses ranging from the lynx possibly having useful hormones or enzymes to being of national significance to the heritage of Spain. The most frequently offered non-creditworthy answers referred to maintenance of biodiversity or genetic variation, or to prevent extinction.

Question No. 4

(a)   Few candidates gained the maximum 3 marks for this calculation and a significant minority failed to score at all. Many tried to add up each year's yield and divide by the number of years leading to an increased chance of a wrong answer. Many candidates had clearly spent a lot of time on what should have been a quick and straightforward question. Of those that did perform the simpler method of subtracting the yield of 1947 from the yield of 1992 and dividing by 45, some lost the 2nd working out mark by incorrectly rounding from 0.0955. It is unusual to have an answer whose units require 3 parameters and many candidates failed to gain this 3rd mark. Commonly, it was for missing out any reference to year. It was noticeable that a number of candidates wrote the unit as 'tonnes ha^{-1} / year', suggesting that they were unaware, not only of the convention for writing units but also, of the significance of the '$^{-1}$'. However, on this occasion such responses were credited.

(b)   The topic of selective breeding is frequently tested as it falls within two separate learning outcomes. Despite this, or perhaps because of this, many candidates gave a generic answer, gaining two or three marks but rarely four. Only candidates who related their answers to the example in the question gained full marks. A number of candidates failed to appreciate 'high yield' as the desired characteristic. Some just referred to 'tall plants' or, resistance to disease. References to measuring yield in the offspring or further detail relating to plant breeding were rarely seen. Some candidates seemed unaware that plants are able to carry out sexual reproduction and responses from such candidates were limited to one mark for a reference to many generations.

(c)   It was pleasing to see many candidates gaining both marks. Of those that didn't it was commonly for making vague references to 'better farming' or 'more soil minerals'. Many cited GM technology, not appreciating that it's development was too recent or that such crops are currently banned in the UK.

Question No. 5

(a)   The vast majority of candidates achieved the mark.

(b)   Around half of responses gained 2 marks. Most candidates drew the backbone correctly. A large minority wrote T, where the U should have been.

(c)   Most candidates scored 2 marks on this question. The most commonly awarded mark was for there not being 3 hydrogen bonds between A and T. Candidates usually scored one other mark for noticing either that RNA nucleotides are not involved in DNA replication or that DNA is not a polypeptide. Crosses were seen in every box.

(d)   Four marks were usually awarded for this question. The most common incorrect response was where 'intraspecific' should have been. Many candidates wrote 'interspecific', 'continuous', or left it blank. A minority of candidates wrote 'speciation' or 'characteristics' in the last space.

Question No.6

(a)   This extended answer question produced responses that varied widely in standard. The simplest and commonest mark to gain was for the hinge region allowing flexibility. Most candidates knew that there were variable and constant regions but their answers showed a lack of accurate knowledge in many. Of the two, the constant region was more commonly described correctly as for binding to phagocytes, although 'white blood cells' was sometimes seen from those who, presumably, couldn't remember whether it was phagocytes or lymphocytes.

The variable region was poorly understood by many. Some thought it had an active site and many went on further to describe its shape as complementary to an antigen but stopped short of stating it bound to the antigen and so failed to get a mark. Others described it as the region for binding to pathogens, without mention of antigen and, again, no mark. Descriptions of specificity often fell short of the clarity required to be awarded a mark and, while candidates often mentioned binding to more than one antigen, they rarely attributed this ability to there being two variable regions. Reference to 4 polypeptide chains was more common than 2 light and 2 heavy chains. Disulphide bonds were often described but some candidates failed to state that they held polypeptides together. If drawn, diagrams were often inaccurate or lacking labels and so were rarely credited with marks for points not made in the text. Attempts were made by a significant number of candidates to reproduce a diagram from a popular text book. This diagram is unnecessarily complicated and teachers could use a simpler straight-sided Y shape.

A minority of candidates seemed to think that an antibody was a type of white blood cell, usually a phagocyte.

(b)   Agglutination was generally better understood than neutralisation. However, many candidates just discussed antigens, or even antibodies, grouping together with no reference to pathogens. Many candidates then stated that the clump was consumed by phagocytes but without the idea that the process was made easier, or more likely. Candidates that described a clump of pathogens as a molecule were not credited.

Those candidates who gained 1 mark for neutralisation knew that something couldn't bind to or enter a host cell, but again there was a common misunderstanding about antigens, with many candidates assuming that they just existed freely rather than on the surface of the pathogen. Other candidates missed gaining the N1 mark by simply stating antibodies bind to antigens rather than the consequences of this – that they are covered and can no longer function as sites for attachment to host cells. Only a minority stated that antibodies bound to toxins; many simply stated that antibodies neutralised toxins, which did not add enough to the stem of the question.

Question No.7

(a)   This question discriminated well between candidates and the range of marks varied a lot. Most candidates understood the role of phospholipids and cholesterol in membranes but few seemed aware of the constituent elements and many thought that phospholipids were soluble in water.

(b)   Most candidates got at least one mark and many scored 2. Some candidates thought the white or cloudy colour was a precipitate and so could not access the second mark. Some descriptions of incorrect biochemical tests were seen.

(c)   Most candidates scored one mark either for writing that there was less fat in mycoprotein or for discussing saturation. Many candidates failed to discuss both ideas so only a minority were awarded two marks. A significant number of candidates simply stated that mycoprotein contains unsaturated fat, without then making a comparison with animal protein, and so could not be awarded the mark.

F213 Practical Skills 1

General Comments:

Candidates' performance in some areas such as tabulation and graphing showed improvement from previous sessions. Fewer graphs showed incorrect scaling or plotting than previously seen with correct use of units and unit symbols. However in others there was a basic misunderstanding on how to plot error bars from standard deviation data onto graphs, with a large number plotting range bars or half a standard deviation instead of one standard deviation each side of the mean plot as required. Candidates found the maths questions especially difficult, for example, the relative activity calculation for Evaluative task 3 with a number of Candidates not attempting the calculation at all. The Species diversity Index was however better attempted, although a number of straight forward maths errors were found.

Centres should prepare Candidates on how to follow the instructions given in the question, such as drawing the required number of cells only as for Qualitative Task 2, or providing a single response when asked to do so, instead of giving a choice of several. In these situations the mark cannot be awarded as the rubric has not been followed.

Drawing skills is another area in which Candidates need more preparation. Too many Candidates had used unclear lines that were neither sharp nor continuous when drawing the lettuce cell and chloroplasts for Qualitative task 2 and the leaf drawing for Qualitative Task 3 often did not fully represent the leaves that were being drawn.

Where answers continue onto a different section of the paper or onto separate sheets this must be clearly indicated at the end of the first part of the response with a reference to where the continuation can be found. The question number and part number must also be added to the start of the continued answer with the Candidates name and number. Securely attaching extra sheets is also vital.

Centres are again requested to secure together the three tasks, used for the mark submission, using a treasury tag and with a summary front sheet correctly filled in with all required details.

This year a number of Centres have had their sample returned because the moderation process generated an invalid order of merit for the candidates in the sample. This requirement is to preserve the Centre's own rank order of candidates which is assumed to be the best measure of their achievement. On receipt of the returned sample, the Centre is expected to remark the whole cohort using the guidelines and marking points highlighted by the moderator. This allows the marks to move in line with the moderator's recommendations.

Understandably, some Centres are not pleased to have their sample returned. However, the moderator must complete an invalid order of merit form, this provides the information needed to direct the Centre to those questions or part questions that are the source of the differences between the original marking and the moderator's judgements. Once re-marking is complete it may be that a candidate's marks for a specific Task are not now his or her best score. In this case the Centre has the option to submit an alternative task with the better score. The Centre is not obliged to re-mark the scripts, although in all cases the whole sample must be returned to the moderator so that the moderation process can be completed.It should be noted that the moderated marks will be used by the OCR algorithm to make a decision about the final marks credited to the candidates. If Centres choose not to re-mark, some candidates may be disadvantaged as a result of the difference between the Centre mark and the moderation

process. Whetherthe Centre chooses this route or not it has the option to request a re-moderation of the original sample through the Enquiry about results process.

Comments on Individual Tasks:

Qualitative Task 1
For Part 1 candidates were required to complete a table with ruled lines, correct headings, unit symbols such as (cm^3) and volumes correctly recorded with consistent decimal places. The description of clarity was not always fully understood so a number of Candidates incorrectly recorded the trend. Centre data was extremely important in this task for the Moderator to decide if the results recorded were worthy of credit. The skilful practice mark was frequently awarded by Centres when the trend was incorrect and no Centre data was provided to support this difference. In Part 2 the calculation in Question 1 required the working to be recorded which was often missing or incorrect. In Question 3, the task sheet provided prompt lines which Candidates were expected to use. The best answers gave the disadvantage and then the explanation of that disadvantage.

Qualitative Task 2
In Part 1 there were three marks for the drawing skills. Many Candidates failed to achieve full marks here, as their drawing skills were not demonstrated fully or because the rubric was not followed. The skilful practice mark referred to the quality of the lines used and the requirement for absence of shading in a drawing. Too frequently this mark was awarded by Centres for poor quality drawings.

In Part 2, many candidates failed to realise that there were two aspects to Question 1: a direct reference to the solution being kept at the optimum temperature <u>and</u> a reference to the temperature dependency of enzymes.

In Question 2 many Candidates did not link the shape of the cell and the control of the cell wall. The water potential for question 3 was often muddled in the responses. Candidates did not always seem to understand the process correctly and a number incorrectly used animal cell terminology such a hypertonic and hypotonic.

Qualitative Task 3
Many Candidates used incorrect spellings for recording the name of a species with many not recording <u>spp.</u> correctly with the dot after it. It was however pleasing that very few were now using incorrect capitalisation for naming species.

Drawings were not always fully representative of the leaves drawn. In fact in some cases it was impossible to recognise the type of leaf drawn. The annotations were often poor with free hand lines for the labels.

For Question 2 the growing tip does need to be explicitly referred to for MP 1 and Mp 3 needed the idea of a large photosynthetic area, so a 'large leaf area' was not enough, although this was awarded by many Centres.

Quantitative Task 1
The species diversity index was fully completed by many Candidates although some simple maths errors that were given credit were found. In this case the mark for that point cannot be awarded but error carried forward marks can be allowed for subsequent responses.
Question 7 was frequently awarded the mark even though the Candidate had not referred to the calculated D value or its significance.

Quantitative Task 2

The graphs were generally well drawn and correctly marked. However marks were, in some cases awarded, although the graph plotted area did not cover 50% of the paper or the lines were thick, sketchy or clearly not a correct line or curve of best fit nor a ruled plot to plot line.
In Part 2, MP 2 was often awarded a mark for a description of the gradient such as a steep line rather than a comparative description such as a 'steeper' line.
For Question 3, a mark may be awarded for a correct value read from the Candidates' own graph, even if that is incorrect.

Quantitative Task 3
Most candidates gained full marks for correctly recording the data in tables 1 and 2 to the nearest 5 seconds. However a few candidates missed this point and recorded to other time values and in some cases these were marked as correct.

The graph in Part 2 was successfully scaled and labelled in most cases and for these Candidates the lines were well drawn. However some lost marks for using two different styles for each of the two lines or for use of incorrect unit symbols. Some Centres incorrectly awarded marks for graphs that had not been correctly scaled to allow the plotted area to cover at least 50% of the paper or for graph lines that were poor with thick or sketchy lines instead of a smooth line or curve of best fit or ruled plot to plot line.

In Q 2 some candidates had not read the question fully and did not realise that it required time not rate. Many Centres had awarded marks incorrectly for such rate references.

In Q 3 the symbol, '<u>s</u>' was frequently not used, and instead the unit 'seconds' was given. This was incorrectly awarded the mark by Centres.

Question 4 is a discriminating question, in particular MP 3 because many candidates had not fully realised that both substrate and enzyme are protein in nature and so both would be denatured.

Evaluative Task 1
In Q 2 the W marks were often missed by the Candidates and yet were awarded.
In Q3, MPs 1 and 2 were awarded the mark when there was no reference to 'more' grazing.
Q 4 was not well answered with most Candidates only scoring 1 mark, but Centres marked this question well. Question 5 was well answered in most cases, however responses to Q 7 demonstrated an incomplete understanding of the effect of humidity on transpiration for a number of Candidates and frequently 2 marks were incorrectly awarded when only MP 2 was present. Question 8 quite frequently only gained MP 1 with little understanding of the n value or the impact on the Index of Diversity, so this was a discriminating question. Marks were sometimes given for stating there was a lower value of Simpson's diversity but this gained no credit as it was given in the stem of the question.

Evaluative Task 2
In Question 2, many Candidates failed to mention molecules or ions or give an example of either but were incorrectly awarded the mark anyway. 'Substances' was most frequently given as the response, but was not worth any credit.

In Question 3 the most likely error was the failure to link the responses to the higher temperature in some way for MPs 1, 6 and 7. This point could also be made by specifying a temperature above 55°C. For MP 3 the word 'phospholipids' was a requirement for the mark since this word is underlined in the mark scheme.

Question 7 was not well marked by Centres as MP 2 was often awarded without any mention of 'hydrophobic' and MP 3 for any membrane reference rather than the molecules within the membrane.

Evaluative Task 3

Q1 was a good question for those with a reasonable understanding since in this case 4 marks were easily achieved. However there were a variety of responses and those with a poor understanding did not fully explain the suggestion to correct their given limitation and so the mark was not awarded. For Q 2, many candidates had not read the question fully and so responded with two entry errors instead of one entry and one calculation error as required. Centres often awarded four marks incorrectly for this type of response. The additional guidance in the mark scheme indicates that the second entry error is an alternative to the first entry error not an addition.

Q3 was not well carried out by many Candidates as there was a misunderstanding or error bars. Only 1 mark maximum out of the 3 possible marks was frequently achieved as range bars were drawn instead of error bars. In some cases half a standard deviation was plotted each side of the mean instead of correctly plotting one standard deviation each side of the mean plot. Where Candidates understood error marks these were three easy marks.

Q 4 (a) and (b) caused no problems at all with the majority scoring full marks.

For Q 5 Candidates often did not achieve the second mark because incorrect readings of the data points were made from the graph. Q 6 was not understood in many cases and often no attempt to answer was made. However those that understood that relative activity was needed scored well as the mathematics required was not difficult.

For Q 7 the main problem was a lack of understanding of the question so that there was no reference to the validity of any response made, nor to the original statement nor any other wording that suggested the conclusion was correct or incorrect. Often there were incorrect data quotes made.

Centres can seek advice on the implementation and marking of Tasks in future sessions by e-mailing GCEsciencetasks@ocr.org.uk. 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. Once the marking process for the tasks is completed, Centre may submit up to four complete sets of Task scripts for each Task; this will generate a report outlining any differences between the Principal Moderator's marks and the Centre's marks.

F214 Communication, Homeostasis and Energy

General Comments:

A wide range of marks was achieved on this paper. The higher marks were achieved by candidates who read the supplied information and data carefully and then considered the phrasing of the question in order to supply an appropriate answer. It was evident that some candidates were intent on providing as much information as possible, doing unnecessary work which went beyond the requirements of the question. Candidates who do so run the risk of losing sight of the question and so not providing information that would have been creditworthy. The allocated space and mark tariff should indicate the amount of information required in the answer.

In this paper, the Quality of Written Communication (QWC) marks are awarded for the correct use and spelling of key terms in specific questions. Technical terms cannot be considered to contribute to the QWC mark if they are not spelled correctly or if the handwriting is such that the individual letters cannot be distinguished. Benefit of doubt is not given in this situation. Candidates are therefore encouraged to make their writing as clear and unambiguous as possible.

Candidates should also be reminded to take care when numbering questions that are continued on the pages at the end of the paper or on continuation sheets. There are many instances of misnumbering. Correct numbering will ensure that the additional material is considered together with the question to which it relates. It is also preferable for candidates to continue on the paper, should there be room, rather than on continuation booklets.

Mark schemes from questions previous papers can be a useful revision tool and can provide some guidance on the level of detail required in answers. They can also be used to clarify information and thus indicate potential misconceptions. It should not, however, be assumed that providing a series of statements from a previous mark scheme will automatically access good marks on a question. The same question will rarely feature in subsequent papers and, if it appears to do so, may have distinct differences from the past question (such as a different command word, which could require a different level of detail, or a different context, which could change the emphasis of the information required). Candidates should read the question carefully and tailor the information provided to answer that specific question rather than applying the principle of 'one answer fits all questions'

Comments on Individual Questions:

Question No. 1

1(a)(i) The parts A, B and C in Figure 1.1 of a chloroplast were correctly named by most candidates. Where errors occurred, they were usually for the misidentification of A (e.g. the inner envelope membrane, thylakoid membrane, or even inner mitochondrial membrane). Very occasionally, stroma was confused with matrix while other candidates referred to C as simply thylakoids.

1(a)(ii) The majority of candidates were able to describe at least one way in which the structure of the granum (part C) was adapted to its function. References to the presence of pigments, chlorophyll or photosystems on the granal membranes were very frequent and many candidates also went on to add that ATP synthase or the electron carriers would also be contained within the membranes. Many also recognised that there would be a large surface area for light absorption or the light independent stage, although this was also a common omission in weaker

answers. Many discussed close proximity to stroma and consequently events occurring in the stroma.

1(a)(iii) The vast majority of candidates correctly ticked B for the stroma. The most common error was selection of C, thinking that the light independent reactions take place in the grana.

1(b) Varied explanations were given as to why the theoretical rate of photosynthesis was not achieved at higher light intensities. Many candidates appreciated that light would no longer be a limiting factor, often suggesting that the other limiting factors could include temperature, carbon dioxide concentration and, occasionally, water. Good answers provided detail of the effect of lower temperatures or the consequences of low carbon dioxide concentration on the light independent reaction. However, some candidates explained why high light intensity would not increase the rate of photosynthesis any further, which was not required by the question.

1(c)(i) Almost all candidates identified species E as being better adapted to living in shady conditions although some were unable to explain why. Many candidates stated that species E had a higher rate of photosynthesis at lower light intensities than species D, or that species E started to photosynthesise at a lower light intensity. While some recognised that species E would reach its maximum rate at lower light intensity, it was commonly referred to as the optimum rate or the plateau. Relatively few commented that species E had a steeper increase in rate with a small increase in light intensity.

1(c)(ii) The most common correct answer provided gained a mark from shade plants having a large surface area to their leaves whilst others discussed the presence of a higher number of chloroplasts. Weaker answers vaguely referred to size of the leaf, but not to its surface area, or suggested that the number of stomata would be a structural difference, Descriptions of adaptations to prevent water loss via transpiration did not gain credit in this question.

1(d) Candidates generally made the link between the heterotroph's need to gain organic molecules from plants, usually by stating direct ingestion although the mark was occasionally awarded for plants being producers at the start of the food chain. Numerous examples of very wordy answers didn't gain any further marks as there was minimal provision of any description at all about organic molecules being produced in the process of photosynthesis, merely making weak comments about the autotrophs using sunlight to build the organic molecules. Such answers were of GCSE rather than GCE standard. The production of oxygen during photosynthesis and its use during respiration were rarely outlined, but where one of these was mentioned, the other was frequently mentioned as an extension of the same sentence. The importance of products of photosynthesis being used in respiration was a rare extension to good answers.

Question No. 2

2(a) Many candidates were able to complete the passage using suitable terms. Common errors were to confuse endocrine with exocrine and cortex with medulla. Very occasionally, neutrotransmitter was used in place of hormone.

2(b)(i) Well prepared candidates were able to interpret the stimulus material in Figure 2.1 and provide good accounts of the events taking place at the various stages leading to the secretion of insulin from the beta cell. Most recognized that glucose would be respired to produce ATP, although some stated that glucose would be converted to ATP which was not credited. While many went on to describe how ATP would block the potassium ion channels, a significant number neglected to add that this would cause an accumulation of potassium ions within the beta cell as they were no longer able to leave. Most understood that the depolarisation of the cell would cause the calcium ion channels to open, leading to an influx of calcium ions and then linked this influx to the movement of vesicles containing neurotransmitter towards the cell

surface membrane and subsequent fusion to it. However, some made the mistake of stating that the vesicles, rather than insulin, would leave the cell by exocytosis. Candidates who did not fully express the mark points tended to be repeating a learned sequence rather than interpreting the information in the diagram.

2(b)(ii) This question proved challenging. Candidates who did gain marks usually recognised that calcium ions were still present in the cell (triggering secretion of insulin). Several candidates knew that the calcium ion channels remained open but did not develop the idea further. Many mentioned that ATP was still present, others stated that potassium ion channels were closed, but few mentioned both conditions. Many of those who mentioned high glucose levels referred to levels in the cell rather than in the blood or to trying to reduce the glucose to zero. Some candidates answered in terms of the time taken for insulin to reach the target cells, rather than in terms of the levels of blood glucose and its effect on the cells. Many candidates did not note the reference to continuing insulin secretion, and referred to what would happen when glucose levels returned to normal (when little or no insulin secretion would take place) and negative feedback.

Question No. 3

3(a)(i) Most candidates were awarded 4 or 3 marks. Some provided multiple answers, which were not credited.

3(a)(ii) Most answers included reference to the transport of pyruvate into the mitochondrion. Remaining mark points were either inadequately expressed, such as referring to the leakage on hydrogen ions but not mentioning the fact that they would not, therefore, pass through the ATP synthase molecule or generate ATP.

3(b) Many candidates answered this question well. Mark points 1 and 2 were normally awarded. Low scoring answers concentrated on an account of aerobic respiration rather than a comparison with anaerobic or the reasons for the lack of ATP production in anaerobic respiration. Some incorrect descriptions of the lactate and ethanol pathways were given. Few candidates referred to substrate level phosphorylation in glycolysis. The QWC mark was normally awarded.

Question No. 4

4(a) There were very few errors in calculation with most candidates giving the correct figure. However, many candidates did not provide units, having failed to spot that the units were not printed on the answer line.

4(b)(i) Around half of candidates correctly identified error bars while a fewer number referred to standard deviation. The majority of the rest assumed they were range bars.

4(b)(ii) The open ended nature of this question led to a variety of responses. The majority obtained marks for noting that most patients starting RRT were male, and that the least was 60%. Candidates needed to discuss the gender split and trends. A very small number of candidates were able to discuss the validity of the data, and gained credit for realising that, with the error bars mostly overlapping, it was difficult to draw firm conclusions. Candidates tended to be confused by this data, with some not making the logical progression that since male patients were referred to then the rest of the patients would have been female. They therefore expressed their ideas more tentatively, referring to 'likelihood' rather than giving a definitive statement, quoting numbers rather than percentages and referring to 'patients' rather than referring to gender.

4(c)(i) The majority of candidates understood that the increase in age would present more complex health problems.

4(c)(ii) Many candidates correctly identified renal vascular disease as has having the greatest increase. However, they were then unable to justify their choice correctly, with most candidates failing to calculate the correct percentage increase. The crucial phrase in the questions was 'most significant' and, as such, the quoting of a simple difference was not enough. Candidates should have considered the increase based on the starting figure and it should have been this, rather than the popularly stated fact that 'uncertain diagnosis' was not a single cause, that led them to the choice of renal vascular disease. Those who suggested 'uncertain diagnosis' did not appreciate that its increase of 10.6% from 12.0% was only a percentage increase of 88% and therefore less than that of renal vascular disease.

4(d)(i) Very few candidates gained a mark here although the majority did give the question careful thought. The word 'function' was emboldened in the question but some still went on to answer in terms of structure e.g. with references to channel proteins. Others discussed blood supply, counter-current mechanisms, differences in permeability and the different procedures of dialysis.

4(d)(ii) This challenging question was hard to access for many candidates. Most who scored marks realised that dextrose would affect water potential, but then did little with this information such as relating this to removal of water from the blood or cell damage. Candidates need to use the term 'osmosis' when describing the movement of water. Incorrect answers referred to the presence of dextrose to feed the cells in the abdomen or to ensure there was not too much sugar lost due to kidney failure.

4(d)(iii) There were some excellent answers that showed good appreciation of how haemodialysis is able to maintain optimal concentration gradients. Many candidates, however, found this even more challenging. Many referred to the differences in convenience or volume of fluid but failed to expand on the idea. Some were distracted by the abdomen and referred to removing waste from only part of the body.

4(e) Many candidates gave the correct answers to this question. The most common pair of incorrect responses was hepatocytes and liver. Candidates were possibly recalling the answer to a similar looking question from last year's paper. This was a question where they needed to draw on their AS knowledge and consider the question context. All A2 units contain questions that draw on previous knowledge and candidates should be prepared to make use of such knowledge.

Question No. 5

5(a) Concise answers achieved full marks, as neurone structure is well known. Few candidates gave details of functions rather than structure, although some supplemented their answer with details of function. Candidates should not imply that a dendron is present in a motor neurone. QWC was normally awarded, although there were the odd mistakes made in the spelling of 'myelin'.

5(b) The majority of candidates obtained these marks, with a small number giving the incorrect answer in the 2nd row.

5(c)(i) Whilst most answers linked evaporation to cooling of the body, a smaller proportion correctly linked this to heat being *used* for evaporation. Candidates need to be precise in their use of language to ensure that the correct information is conveyed. Phrases such as 'taking with it', 'transferred' and 'absorbed' did not indicate that the body heat was used to provide the energy for evaporation. Few candidates referred to the high latent heat of vaporisation of water.

5(c)(ii) Although most candidates clearly understood the principles of shivering and its role in raising body temperature, relatively few had absorbed the information given at the start of the question. Candidates were expected to relate this to the rise in the thermoregulatory set-point during a fever.

5(d) Most candidates realised that the vasodilation would reduce the body temperature even further. However, vasodilation continues to be misunderstood. Candidates often wrote that arteries / capillaries / veins dilated or that blood vessels actually moved closer to the skin surface during the process. Consequently, mark point 1 could not be awarded. Those candidates who discussed the long-term effects of alcohol on body chemistry did not appreciate the question context.

F215 Control, Genomes & Environment

General Comments:

This paper gave a good spread of marks and the vast majority of candidates attempted all questions with no suggestion that candidates had struggled to finish the paper. Candidates who were well-prepared were able to gain marks across the range of topics covered. However, it was clear that some candidates did not focus their answers on the question being asked, but instead gave as much information about the topic as possible. This led to some candidates losing sight of the question and failing to provide information that would have been creditworthy. This also led to many candidates writing beyond the allocated space. These candidates should be reminded of the importance of using the continuation sheets at the end of the paper and numbering those questions correctly. This allows examiners to clearly link the response to the correct question. A number of candidates were still using additional page continuation booklets instead of the additional pages at the end of the exam paper, and this should be discouraged.

The correct use of technical terms was evident in many of the responses given by candidates, and it was pleasing to see the number of candidates who achieved full marks on the statistical analysis in q 4b(i). However, the use of examples of particular species in questions, together with associated data, often confused those candidates who lacked wider biological knowledge, and meant that questions which required application of biological knowledge were often poorly answered.

Candidates who spent time learning the mark schemes from previous examinations, without developing sufficient supporting biological knowledge often gave inappropriate and incorrect responses to questions. For example, there was a sizeable minority of candidates who confused Elks (a deer in question 2) with Elms (a tree featured in question 3, June11), and therefore stated that elks were trees shot by hunters or eaten by wolves. Polyploidy and linkage were also two areas of the specification which were poorly understood.

Comments on Individual Questions:

Question No. 1

1a(i) Most candidates realised that division 1 was mitosis and division 2 was meiosis: however, some candidates lost the mark for listing just meiosis I or II , or for misspelling meiosis.

1a(ii) Many candidates misread the question and thought that they needed to give the **stage** of division occurring at points A and B rather than the **processes** occurring at A and B, and gave the responses of interphase and telophase / cell division, which gained no credit.

1b This question discriminated well across the mark range, with many candidates able to relate genetic variation to the stages of meiosis. Weaker candidates merely listed the events of each stage of meiosis, without linking them to the way in which genetic variation was achieved, gaining no credit. Candidates should be encouraged to read the question again after they have answered it to check they have followed the instructions correctly.
 The most common responses seen talked about independent assortment of chromosomes in metaphase I and chromatids in metaphase II ,crossing over in prophase I, mutation and random fertilisation, all of which gained credit .However, some candidates confused the terms chromosomes and chromatids, for example talking about crossing over between sister chromatids, which lost the marking point. Other common errors were a lack of appropriate detail, for example fertilisation rather than random fertilisation, daughter cells rather than gametes, which meant that the marking points F1 and F2 could not be awarded.

Few candidates related the processes involved in creating genetic variation to the consequences of that process, i.e. the production of new combinations of alleles in the gametes, and so failed to gain the QWC mark.

Question No.2

2a(i) This question was generally well answered. The majority of candidates were able to identify either or both of the peaks in 1988 and 1994 and some went onto mention the decrease and increase in population between these dates, finishing with the decrease after 1994. It was encouraging to see general statements about the fluctuations in the data and the overall increase from 1965 to 2002. Common errors were to describe trends from 1965 to 1988 or comment on the numbers of shot elk. Other mistakes made were misreading the data or not mentioning any dates at all.

2a(ii) Most candidates got the first marking point and understood that the number of elk shot would be recorded and was therefore accurate. However, fewer candidates gained the second marking point about why the method was not valid. The candidates who did get it tended to talk about illegal hunting making the data less valid, as opposed to hunting success being independent of overall population size.
 A common mistake was to talk about hunting scaring off elk from the area or elk dying from factors other than hunting. Some candidates also confused their answers by talking about ecological sampling in general and not relating it to the question asked.

2b(i) Most students used additional sheets for this question but very few gained additional marks for their extra effort. Mostly they continued with lengthy descriptions and explanations of predator-prey relationships and gained no marks for that.

Those candidates who recognised the need to explain the population growth curve and did so in a logical sequence, setting out a section for before 1995 and one for after 1995, gained the most marks for this question. Very few candidates recognised that limiting factors were involved.
A good number of candidates recognised that the population increase was due to an abundance of food, enough space, enough mates or less predation or less hunting. Some candidates didn't mention the population at all or mentioned the size of the elk, and not the elk population. General references to population being affected wouldn't gain marks here as it was specifically for a reason linking it to an increase in population.

A minority of candidates mentioned the carrying capacity being reached before 1995 but sometimes it was not always awarded due to it being referred to after 1995.
When candidates used the proper terms of intraspecific and interspecific competition or described them correctly they often missed the marks by not giving a **named** resource or linking it with population size , rather than a named resource.

Many candidates gained the mark for disease affecting population size but sometimes didn't link it with a decrease or dip in population size.

The link that any decrease before 1995 was not due to the wolves as none were present was rarely awarded, but the majority of candidates mentioned that after 1995 there was a decrease in elk population and it was likely due to the wolves. This often triggered the QWC mark being awarded. Very occasionally candidates mentioned the idea that the effect of wolves on population may be debatable.

There were a number of candidates who wrote about Elm trees or Elk trees and not Elk. In some cases, candidates went into detail of photosynthesis and mineral ions in the soil, showing a complete misunderstanding of the question asked, and relating it to a question asked about Elm trees in a previous paper.

2b(ii) This was generally a well answered question with references to maintaining or increasing biodiversity and the idea of conserving the wolf as a species, gaining two marks.
Only a few answers included reference to biological control of the elk population, which if uncontrolled would result in damage to the ecosystem by overgrazing. A lack of key terms (ecosystem/management/maintenance) stopped some candidates from getting both marks and several candidates used the word 'conservation' in their answer, despite it being in the stem of the question.

Common mistakes were to focus the whole answer on just increasing biodiversity or helping the wolf population, without making a second point for the other mark, or to give a general definition of conservation without relating it to the question asked.

Question No.3

3a The vast majority of candidates were able to identify the bases correctly from the automated sequencing graph, with base 6 labelled as A being the most common error.

3b(i) This was also well answered by the majority of candidates, though some candidates failed to attempt the question. The most common error was a failure to inset the correct sequence of bases in all three rows, before putting in the labelled base.

3b(ii) This question proved to be a good discriminator, with few candidates gaining full marks. Most candidates realised the question was asking them to explain the process of electrophoresis, though some explained the PCR process instead, or the process gene sequencing in general.

Many explained that the DNA was negatively charged so moved towards the positive anode, but many then failed to get the third marking point as they stated that the smallest fragment moved further and failed to say that they moved fastest, possibly because this had been the correct marking point in a previous question. In this case the question was related to the use of electrophoresis in sequencing,rather than as a method of just separating fragments.
A number of candidates lost a marking point for saying 'the fragments moved towards the positive cathode'.

3c(i) Generally, a two mark question would involve identifying two distinct marking points, but very few candidates did this. Many gained 1 mark for correctly stating that smooth muscle contracts. However, a common misconception was talking about the muscles constricting, which gained no credit. Few candidates mentioned inflammation or excess mucus production for a second mark.
 A significant number talked about the long term effects of smoking or bronchitis on the bronchioles, and had clearly not read the question properly, since it was asking about the effects of asthma on bronchioles in children.

3c(ii) Very few candidates were awarded this mark. Most candidates merely rephrased the question stating 'that a decreased diameter reduced the volume of air expelled'. Examiners were looking for the idea that the reduced diameter increased resistance to air flow, and that this means additional force is required to exhale, but this was rarely seen.

3d This question discriminated well,with many candidates gaining 3 marks, for correctly linking a change in nucleotide sequence to a change in primary and tertiary structure of the receptor, so that salmeterol was unable to bind. A common error was to talk about proteins in general,rather than receptors ,or to not mention that a mutation leads to a change in base sequence . Weaker candidates related their answers to enzymes, and discussed changes to the shape of active sites which gained no credit.

3e(i) Many candidates scored both marks on this question by applying their knowledge about receptors to this new situation, and suggesting that montelukast could bind to the mutated receptor due to it being complementary in shape, whilst salmeterol could not. Other acceptable suggestions included that montelukast had different receptors which were unaffected by the mutation or that the drug worked in a different way which did not involve the mutated receptors. A minority of candidates talked about building up a resistance to salmeterol or having no resistance to montelukast, which did not gain credit.

3e(ii) A surprisingly large number of candidates failed to get this mark, which asked about the reliability of this trial. Some candidates talked about the lack of a control group, length of study or age range of the group, rather than the fact that the sample size was too small to be reliable. Generalised statements such as 'if you increase the sample size then reliability will be increased' were not credited.

3e(iii) It was surprising to many examiners that most candidates struggled to answer this question. Many candidates believed that genetic material can be found in proteins and enzymes, or just in saliva in general. Few candidates realised that cells from the cheek, white blood cells and salivary gland cells can be found in saliva, and that this can be used as a source of DNA.

Question No.4

4a(i) This question was answered well, but sometimes candidates confused their answer with types of speciation. Allopatric was a common mistake, as was geological as opposed to geographical.

4a(ii) The majority of candidates answered this question correctly. The most common error was to name it as mutation.

4a(iii) A minority of candidates did not identify C correctly and gained no marks. Identifying C because it has the greatest change in allele frequency or the use of figures to demonstrate the same point was the most common correct answer. Some candidates failed to compare the allele frequency change to other populations so didn't gain the mark.

 Fewer candidates went onto gain a second mark for identifying C as the smallest population, many attempted it but again without making the answer comparative, gained no credit.
Other mark points were very rarely awarded as candidates did not talk about individuals or the gene pool.

4b(i) It was pleasing to see that the vast majority of candidates had a thorough understanding of the chi-squared calculation, gaining full marks. Those who didn't tended to pick up 2 marks for getting the column numbers correct as they had made mistakes in their final calculation.

4b(ii) Many candidates gained this mark. Some candidates stated ´accept´ and lost the mark or didn´t give sufficient detail. For instance, several candidates just wrote 'reject hypothesis' without further explanation, and some did not mention critical value or chi squared value in their answers.

4b(iii) This question was very poorly answered. The majority of candidates gave ´epistasis´ as their answer and some also gave ´sex-linkage´ as an answer, which gained no credit. A significant number discussed environmental pressures as being the cause, even though the question asked for a genetic explanation. Those that correctly identified linkage were mostly able to give good descriptions and gain full marks. A few candidates who did mention linkage did not get mp 3 as they mentioned linked genes being inherited together rather than linked alleles being inherited together.

Question No.5

5a Few candidates scored 4 marks on this question. Where candidates gained 2 or 3 marks, this was for the use of dry or biomass and the need to measure the energy content of both the producers and herbivores. Many candidates were able to identify the use of a bomb calorimeter with detailed descriptions of their use. However, most candidates failed to correctly give the calculation needed to work out the percentage efficiency of energy transfer, and so failed to gain full marks. Weaker candidates talked about pyramids of biomass, and measuring dry mass by the use of calorimetry. Some candidates missed the point of the question altogether, and gave a theoretical account of energy flow between trophic levels.

5b A Generally well answered question, with the majority of candidates gaining full marks. Producing strawberry plants which grow quicker was the most common point to get wrong, with the choice of E given. Some candidates put multiple letters in the boxes, which examiners allowed, if all letters given were present as options in the mark scheme.

5c Most candidates scored highly on this question. The first marking point was the main one missed, by candidates failing to include escape in their descriptions of a reflex. A minority of candidates confused kinesis and tropism with taxes. Some candidates failed to read the rubric of the question and just put the terms innate/ learned in every box which failed to score any marks.

Question No.6

Overall, this question proved the hardest on the paper, with many candidates failing to understand the process of polyploidy in plants, or to be able to apply synoptic knowledge of stem cells to q6a(ii).

6a (i) This question discriminated well, with only the most able candidates gaining full marks. The most common correct answer given was for saying that hormones bind to receptors on target cells, gaining 1 mark. Several answers gave descriptions of how hormones are transported in animals and plants as a similarity, or generic statements about being released and affecting a target tissue, which gained no credit. Those gaining full marks described how hormones bind to receptors, leading to a series of enzyme reactions taking place inside the target cell.

6a(ii) Candidates seemed to find this question a challenge with only a few gaining marks for recalling that plants have meristematic tissue. Good answers would then go on to describe this tissue as totipotent with higher-scoring candidates demonstrating a clear understanding of the need for meristem / undifferentiated cells in asexual reproduction. A few candidates correctly described the role of stem cells in animals. Several answers gave long extended descriptions of vegetative propagation which gained no credit. However, some candidates still struggle to understand that because most animal cells have become specialised they are unable to reproduce asexually. Many incorrect answers referred to animals only being able to reproduce sexually without giving explanations or reasons of why this was the case. A few candidates confused self-fertilization with clones, describing self pollination in plants as a type of asexual reproduction.

6a(iii) Again this question posed a real challenge to candidates and showed a poor understanding of the term polyploidy. A sizeable number of candidates made no attempt to answer. Where candidates did gain a mark, this was generally for grains/cells being of increased size and therefore giving a higher yield. Very few candidates seemed to appreciate the role of polyploidy in overcoming hybrid sterility by facilitating meiosis (so failed to score MP1, 2, 3 or 4). Many candidates concentrated on dubious consequences arising from cells having more

genes/alleles (such as masking undesirable recessive traits) or were side-tracked into brief accounts about artificially selected characteristics.

6(b) This question produced a wide range of marks, and was generally a well - answered question with most candidates having a good attempt at both parts. Candidates lost marks by failing to focus on the mechanisms required to produce the responses to light in both plants and humans.

Cress seedlings

Many candidates scored well here and it was good to see many answers including details of cell elongation and the mechanism of cell wall loosening. Many candidates scored marking points 3, 4, 5 and 6. Interestingly, fewer candidates scored marking point 1, forgetting to say that auxin is produced in the tip or to mention the diffusion of the auxin, for marking point 2.

Human

Many candidates did not score as well on this part. Many lost marks by the imprecise use of terminology, such as the terms signal / message or impulse instead of action potential for marking point H2. Very few linked this question to the detail of muscle contraction. A minority of students mentioned contraction of muscle cells or muscle fibres with the majority just saying muscle, which did not get marking point H5. A significant number of candidates concentrated on the role of the autonomic nervous system and benefit of reflex actions in preventing injury, and were awarded no marks at all. Creditable answers generally scored H1 with fewer scoring H2 and/or H3.

Question No.7

7a(i) This question was generally well answered by candidates, with the effects of thrombosis being best understood. A number of candidates did not link high blood pressure to a burst blood vessel in the brain, yet some of these were still able to gain marks by discussing atherosclerosis. Candidates most often lost marks by not including each logical step in their explanations (e.g. for thrombosis: blood clot – lack of blood flow – lack of oxygen – no respiration). Thrombosis (a process) was also incorrectly substituted for a thrombus / clot (a noun). Unusually in this question candidates could state the same things in both parts of the question and get maximum marks.

7a(ii) Few candidates were able to explain that the drug for counteracting thrombosis would increase bleeding or would be ineffective in treating the cause of the stroke. Many confused answers were seen describing the drug thinning the blood, with this being linked to an increase in blood pressure.

7a(iii) Many candidates were able to correctly describe the functions of different parts of the brain and understand the consequence of damage to each of these areas. However, several candidates simply stated these functions, and struggled to write an answer that was in the correct context. Cerebrum and cerebellum were sometimes confused. Both candidates and teachers need to focus their study of the brain on those anatomical structures named in the OCR specification. Attempts at detailed answers sometimes achieved no marks as smaller structures were named (e.g. frontal lobe, association area) with no link to the correct named parts. By far the majority of candidates focussed their answers on named parts of the brain and did not give the overview required by marking point 1.

7b   Most candidates were able to make some sensible suggestions, in the correct context, in response to this question. Marking point D1 was most commonly given, but only a minority of candidates were able to explain that the reduced seed production was due to energy or

resources being used to make nicotine instead (MP D2). Several candidates were also able to identify insect deterrence as a selective advantage (MP A1), and a number of those then went on to gain marking point A2 (usually for increased survival). In general, candidates need to be reminded to look for both sides of the argument and identify selective advantages and disadvantages. A few candidates gave confused answers falsely linking the addictive properties of nicotine in humans to insects that might continue eating the plant in order to get more nicotine.

7c(i) The majority of candidates gave the precise location of the receptors as being the postsynaptic membrane. A small number realised that this would be the sarcolemmma in this particular case. Both responses gained the mark .

7c(ii) Describing how nicotine is thought to work proved difficult for many. This was usually a result of confusion between this receptor scenario and the action of enzymes, as many references to active sites and nicotine acting as a competitive inhibitor were seen. Correct references to it binding to the receptor causing depolarisation or an action potential gained credit, along with the idea that the receptor was unable to return to the standby state. Other valid ideas included the stopping of action potential transmission altogether or a reduction in the rate of transmission.

7d(i) Most responses only referred to the xylem or phloem as tissues involved in transporting neonicotinoids, but the correct mechanism linked to each of these was also needed to gain marks.

7d(ii) The majority of candidates were able to suggest why neonicotinoids are considered to be safe. Ideas of them not binding to receptors or being broken down in the digestive system were most frequently given.

F216 Biology Practical Skills 2

General Comments:

Centres are required to submit their trial data with their moderation sample. This year Qual 1 and Qual 3 had marks which had to be verified from the trials or the TLC strips. This information was available together with the Tasks when they were first published before the Christmas release date for the remainder of the mark schemes. Many Centres had to be reminded of this during the moderation process. A number of email reminders were sent out including a final notification to Centres which had still not provided adequate information. Centres which were unable to provide supporting information could not have these marks credited, to their candidates' detriment.

Again this year there have been a number of Centres who had their sample returned because moderation generated an invalid order of merit amongst the candidates in the sample. The purpose of this procedure is to preserve the Centre's rank order of its candidates which is assumed to be the fairest measure of candidates' achievement. When the sample is returned, the Centre is expected to remark the whole cohort so that it comes in line with the moderator's recommendations. Understandably, Centres are disappointed to have their sample returned. However, the moderator provides enough information to guide the Centre towards which questions or part questions are the source of the difference between the original marking and the moderation process. After re-marking, should a candidate's marks for a particular Task now not be his or her best score, then the Centre has the option to submit the better score. The whole sample must be returned to the moderator so that the moderation process can be completed. The Centre is not obliged to re-mark the scripts. However, the moderated marks will then be used by the OCR algorithm to make decision about the final marks to be credited to the candidates. At this point, without Centre input, some candidates may be disadvantaged as a result of the difference between the Centre and the moderation process. Irrespective of this, the Centre has the option to request a re-moderation of the original sample.

Comments on Individual Tasks:

Qual 1
Extraction of photosynthetic pigments and their identification using TLC was enthusiastically embraced by Centres who were at ease with biochemical practical work. The Task was completed by many Centres very effectively; some were able to reliably produce as many as ten pigments or breakdown products. Other Centres had a very different experience, though candidates were usually able to obtain enough pigments for all marks to be available.

Qual 2
Observations using a microscope and drawing skills were assessed in this Task. Question 1 required accurate drawing, a significant number of candidates were unable to produce diagrams of adequate quality to gain the single mark for that skill. Candidates were required to annotate a drawing of the microscope slide in question 3a. A few candidates had little idea of how to respond to this.

Qual 3
Ecological field work involving the estimation of ground cover related to two soil types appealed to many Centres. The collection and interpretation of the data was challenging to many candidates as was Part 2 question 2 where candidates often reworked the word subjective and failed to give a satisfactory response. It will be noted that three of the marking points for this question required an explanation of 'measurement' or 'quantitative'. Candidates tended to waffle, clearly not really understanding the nature of the ACFOR scale. Question 3 explanations were often lacking in rigor and showed poor understanding of the effects of abiotic factors on plants.

Quant 1

In this Task microbial growth is at the Centre of the exercise. The majority of candidates were able to complete it adequately, but a number did not fulfil the outcomes on page 3 to an appropriate standard. Question 5a required some thought and a few candidates simply did not reason through what they had done in order to complete the calculation. The error carried forward principle was correctly used by Centres with candidates who had difficulty.

Quant 2

This Task considered the effects of temperature on lipase. It was effectively executed by the majority of candidates. The appearance of a gradient calculation proved problematic. Candidates had to select the most active sample and use that as the basis for the maths. Unfortunately both of these requirements were occasionally misunderstood. Some candidates did not seem to know the difference between a positive and a negative value.

Quant 3

This Task was about invertebrate behaviour in response to a change/difference in an abiotic factor. A considerable number of candidates had been well taught about behaviour with their enthusiasm showing in the vocabulary and text used. A few candidates fell prey to thinking that because the practical itself was straightforward, then the responses should be in the same vein. A few candidates didn't seem to realise that an investigation into behaviour has to start from a baseline assessment and failed to include a start value at time zero in the table on page 5.

Eval 1

This is the follow-on from Quant 1 microbial growth. This Task was well done by higher ability candidates. Others tended to struggle with clear explanations for all parts of questions 4 to 7, perhaps with the exception of 5a. Question 7a was often poorly marked by centres with half of each bullet point being credited as two marks. This is most unfortunate since the tolerance for the whole exercise is +/- 2.

Eval 2

This is the follow-on to Quant 2, the effects of temperature on lipase. This Task was generally well completed. The main areas of difference were with question 6. For part 6a, a considerable proportion of candidates did not supply responses which expressed a clear understanding of the difference between precision and accuracy. Confusion and/or substitution of these two words one for the other must negate the responses for the first part of bullet point 1. With question 6b candidates often didn't explain the first part of bullet point one adequately.

Eval 3

This is the follow-on for Quant 3 behaviour. Able candidates scored well in this Task. Questions 7e and 8 were the most challenging, though many candidates did confuse the effects of surface area on water loss in question 5

Centres can seek advice on the implementation and marking of Tasks in future sessions by e-mailing GCEsciencetasks@ocr.org.uk. 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. Having completed the marking process, Centre may submit up to four complete sets of Task scripts for each Task; this will generate a report outlining any differences between the Principal Moderator's marks and the Centre's marks.

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