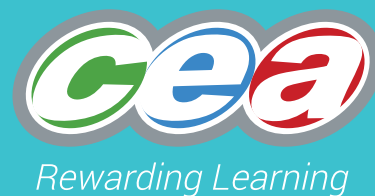


GCSE



Chief Examiner's Report Biology

Summer Series 2023



Foreword

This booklet outlines the performance of candidates in all aspects of this specification for the Summer 2023 series.

CCEA hopes that the Chief Examiner's and/or Principal Moderator's report(s) will be viewed as a helpful and constructive medium to further support teachers and the learning process.

This booklet forms part of the suite of support materials for the specification. Further materials are available from the specification's microsite on our website at www.ccea.org.uk.

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GCSE BIOLOGY

Chief Examiner's Report

Subject Overview

Centres were provided with Advance Information (AI) which listed the major areas of the specification content being examined in each of the assessment units. It was commented by examiners that the papers accurately reflected this AI.

For the most part, it appeared the AI was well utilised by many candidates, who focused on the topics and were familiar with the key terms and phrases to help them access the marks available. It has to be said, however, there was also evidence to suggest that some candidates did not use the AI to its fullest extent.

This year's suite of papers was successful with a large range of topics from different areas of the specification being examined. Candidates of different abilities were provided with a fair opportunity to demonstrate a variety of skills and respond positively to the questions asked in each of the assessment units. Like previous years, some good discriminatory questions throughout allowed for good differentiation and subsequently a good range of marks. It was felt that the language was, once again, appropriate for the candidates throughout the suite of papers.

The use of diagrams and the layout of the papers were effective in providing stimuli and guidance for candidates to help them access the questions. Despite this, some aspects of examination technique are still lacking. These need to be addressed as part of future examination preparation to help improve overall candidate performance. Some candidates still do not read questions carefully enough and do not follow instructions resulting in an unnecessary and avoidable loss of marks. There also seems to be an issue with the terms, 'description' and 'explanation'. On occasions, these are not both addressed when answering questions, don't match or are sometimes mixed up. Also, some candidates don't seem to realise that providing evidence to support an answer does not always have to include data.

To help candidates in the future, questions will clearly state if data has to be provided or not. Candidates must also ensure that labelling lines make contact with the structure they have been asked to identify.

After the lack of use of comparative language was highlighted as an area of concern in last year's report, it was encouraging to see some improvement this year. Hopefully this will be a continuing trend moving forward.

It was commented by some examiners that there was a deterioration in the Quality of Written Communication (QWC) compared to previous years. Candidates should be advised to write at least two sentences, keeping these short and concise. Capital letters and full stops should be clearly evident. In some cases, handwriting could be improved which makes marking much easier.

Assessment Unit 1

Cells, Living Processes and Biodiversity

Foundation Tier

Unit Overview

Overall, candidates responded well to this paper. The standard of answers was generally good, although only a minority of candidates achieved over 60 marks. There was clear evidence, however, that candidates of differing abilities accessed marks across all the questions in the paper.

Q1 Overall, most candidates demonstrated a good knowledge of plant cell parts and their functions. Some parts were mixed up, especially thinking that the nucleus performed the function of mitochondria, describing it as the powerhouse of the cell. Other candidates did not know the function of the cytoplasm in a cell. Most candidates also recognised that parts B and E were common to both plant and animal cells. Some used words instead of letters in their answer. As a result, cell membrane was allowed as a worthy answer, even though it was not lettered in the diagram.

Q2 Most candidates demonstrated a good basic knowledge of enzyme action and answered Part (a) well.

In Part (b), some candidates mixed up the names of enzymes with amylase being a common mistake.

Q3 The iris and pupil were generally well known. Many candidates correctly identified the change to the pupil in bright light, but some lacked the detail to secure the two marks in Part (b) (ii). Often, candidates correctly stated that less light would enter the eye, but then repeated what was in the stem of the question by stating this would protect the eye. Only the more able candidates made reference to damaging light-sensitive cells. It was encouraging that some candidates knew the refraction function of the cornea as well as the lens.

Q4 This question was well answered, although the understanding of the word 'endothermic' proved a challenge for some candidates; a reference to heat was a common mistake.

Q5 The standard of labelling the excretory system was generally good in Part (a). The bladder was particularly well identified, but some candidates struggled labelling the ureter and urethra.

The calculation in Part (b) (ii) involved simple addition and subtraction. Many candidates successfully calculated the volume of water lost in urine, although some subtracted or added incorrectly.

In Part (b) (iii), many candidates correctly linked the lack of sweating in the winter to lower temperatures.

Q6 Parts (a), (b) and (c) were answered well by those candidates who were secure in their knowledge of this topic. Some vague answers were given by others. In Part (b), the provision of more space was sometimes not linked to less competition.

There was some misunderstanding on the part of some candidates in Part (d). A definition of biodiversity was sometimes given rather than how it was increased. Subsequently, this proved to be a good discriminatory question.

- Q7** Candidate knowledge was good in respect of answering Part (a). A good range of marks were obtained in Part (b). Overall, the standard of answers in terms of description was very good, but the explanation of how insulin returns blood glucose concentration to normal was poorly answered, lacking significant detail.
- Q8** Part (a) was well answered. The main challenge for candidates was drawing the pyramid of biomass in Part (b) (ii). Often, bars were not the same depth, not centred and mis-plotted, perhaps indicating that candidates' experience of drawing these was limited.
- Most candidates demonstrated a good knowledge of why the energy available at each trophic level decreases along a food chain in Part (c).
- Q9** In the main the bronchus and alveolus were correctly identified by most candidates
- In Part (a) and arrows were correctly added for the flow of oxygen, although some did not clearly enter the capillary.
- Despite Part (c) being a straightforward factual recall question on gas exchange adaptations, many candidates did not secure full marks. Some answers lacked detail and descriptions did not match explanations.
- Q10** The correct definition of a population was not well known by many candidates for Part (a). The definition of biodiversity was given instead by a number of candidates.
- Overall, good mathematical skills and interpretation of data were demonstrated by the majority of candidates in Parts (a) (ii) and (b). Some, however, did not read the question carefully enough and used the wrong years in Table 1, therefore losing marks. Some marks were able to be salvaged on an ECF (error carried forward) basis.

Higher Tier

Unit Overview

In this paper, candidates of differing abilities were provided with the opportunity to display a variety of literacy, numeracy and analytical skills as well as demonstrate their knowledge and understanding of the topics examined. Some good discriminatory questions throughout the paper allowed for good differentiation and subsequently a wide range of marks.

There were many short recall questions for candidates who had completed adequate revision and more challenging longer questions that required candidates to link ideas together and write cohesive responses which emphasised overall understanding.

It was evident that when answering some questions, some candidates seemed very keen to recall knowledge they had learned, but need to be more succinct in their responses and ensure they have addressed what is being asked in their answers.

- Q1** In Part (a), the parts of the respiratory system were generally well known, but some candidates confused bronchus and bronchiole.
- Part (b) proved to be an unexpected but effective discriminator. Some candidates drew the arrow in the wrong direction. Gas exchange was sometimes confused with the direction of gas movement and arrows were not drawn into the blood plasma or red blood cell. Some candidates need to be more precise when drawing arrows or labelling lines.
- Overall, the adaptations for gas exchange were well known in Part (c), although some explanations were often vague with no reference to diffusion rate, distance or gradient. Also, descriptions and explanations often did not match and some candidates lost unnecessary marks for stating the same marking point.

Q2 In Part (a) (i), only the more able candidates accurately defined the term ‘population’, most demonstrating a varied understanding of the concept. Stating the ‘number of species’ rather than the ‘number of a species’ was a common error, although this could have been the result of a simple grammatical mistake.

Most candidates demonstrated good mathematical skills and interpretation of data in parts of this question. The calculation was generally well done in Part (a) (ii), although some candidates used the wrong denominator in their division.

In Part (b) (i), some candidates lost marks by not following the command words ‘suggest’ and ‘explain’, often restating unnecessary data from the tables.

Overall, the reasons for the decline in tiger numbers were well described in Part (b) (ii), as were conservation strategies in Part (b) (iii).

Q3 While some candidates knew this topic well, other answers were somewhat disappointing with candidates demonstrating a poor knowledge of a straightforward part of the specification.

In Parts (a) and (c), there was some confusion between glycerol, glycogen and even glucagon. Fatty acids were sometimes mixed up with amino acids.

In Part (b), incorrect reference to overall protein and carbohydrate content was penalised.

In Part (c), the complex storage carbohydrates were often not known or mixed up.

Q4 While the villi were generally well known, their precise location in the digestive system tested in Part (b) was not. The vague term ‘small intestine’ was often stated but was not rewarded.

In Part (c), some candidates were unable to correctly label the blood capillary, lacteal being a common mistake.

Part (c) proved very discriminatory, only a minority of candidates understanding that the constant movement of digested food molecules away from the ileum contributed to the maintenance of a concentration gradient.

Most candidates were able to give one digested food molecule found in the blood capillary as an answer to Part (d). However, a minority gave ‘protein’ instead of amino acids, as an incorrect answer.

Q5 The reflex arc was well understood, but once again, marks were lost by some candidates who lacked precision in drawing a labelling line to the effector or muscle in Part (b) (iii). Drawing this labelling line to the pin in the diagram was another common mistake.

Q6 Overall, candidate knowledge of photosynthesis was good, although the balanced chemical equation was not always correctly recalled.

While the majority of candidates understood the concept of limiting factors well, the main discriminator in this question was the varied answers to Part (b) (i). Some candidates were not clear regarding the significance of the graph levelling off. Many answered 6 instead of 5.4-5.6 for the light intensity when light was no longer a limiting factor.

In Part (b) (ii), candidates were asked to draw a line on the graph. Sometimes this was not clear and neat, therefore proving difficult to see.

Q7 Historically, the nitrogen cycle has proved challenging to candidates and once again a question on this topic proved discriminatory across the candidature.

The question, however, was largely based on factual recall and provided candidates with a good opportunity to access the marks available.

Different interpretations were evident in candidate responses, but the mark scheme was adapted to reflect this.

While some candidates were well-prepared and demonstrated a sound, detailed knowledge of the topic, others mixed up the names and functions of the processes.

Candidates are advised to learn the processes in the nitrogen cycle and know how to spell them. Too often, composite terms are written which are a combination of two processes; ambiguities such as these cannot be rewarded.

Another misconception is referring to nitrates as nitrogen compounds, the latter simply taken from the diagram by a large number of candidates.

In Part (b), many candidates obtained full marks for an accurate description of active uptake of minerals.

Candidates lost marks in Part (c) despite being able to access full marks by providing a description of denitrification, nitrification, nitrogen fixation or active uptake.

Q8 The functions of the kidneys should be reinforced as a teaching point using the correct terminology. Often, the terms excretion and osmoregulation were not used by a significant number of candidates, some using vague descriptions instead.

While the calculation was generally well answered in Part (b) (i), not all candidates were able to read off the correct data from the graph. Some included the volume of water produced before the litre of water was drunk.

Most candidates were able to name anti-diuretic hormone (ADH) in Part (b) (ii), but the effect of reduced production of ADH on the volume and concentration of urine proved challenging and presented a variety of inaccurate and incorrect answers. Some candidates were not precise enough in respect of the direction of the reabsorption of water. Statements which made no reference to where the water was reabsorbed from or where it was going to were not rewarded.

In Part (b) (iv), vernacular terms rather than scientific terminology was penalised.

Q9 The description of the trends in Part (a) was poorly answered. Some candidates did not give an overall trend, simply focusing on one or two specific age groups. Others listed data rather than stating an overall difference and similarity.

The sources of stem cells and the advantage of using a patient's own stem cells were well understood in Part (b). The pre-treatments used in treating leukaemia and their side effects were well known. The QWC mark, however, was awarded on fewer occasions compared with previous years.

In Part (b) (iv), the role of stem cells dividing and differentiating was correctly described by most candidates. The mark awarded for explaining they differentiated into white blood cells was often missed, a point which is critical in the treatment of leukaemia.

Assessment Unit 2

Body Systems, Genetics, Microorganisms and Health

Foundation Tier

Unit Overview

This foundation level paper allowed candidates of varying ability to access all questions. Only a minority of candidates did not attempt to answer a number of questions. The questions provided good differentiation reflected by a wide range of marks. Mathematical skills were generally good, but literacy could be improved with better handwriting, as this was poor at times and on occasion illegible.

- Q1** The parts of the female reproductive system were generally well known with most candidates securing some of the four marks available.
- Q2** The structure and function of arteries and veins were generally well known, although some candidates mistakenly stated that arteries contained valves. In contrast, descriptions of the thickness of the capillary wall were often too vague. Incorrect answers that were not credited included thin wall, very thin wall and thin cell wall.
- Q3** The identification of the testes and its function were well known, with nearly all the candidates correctly identifying testosterone. In Part (b), secondary sexual characteristics were also well known overall, although some candidates lost marks for giving the same marking point twice. In Part (c), a surprising number of candidates were unable to give a secondary sexual characteristic common to both males and females.
- Q4** The tally table was completed correctly and the graphs were accurately drawn by the majority of candidates. Some graphs were shaded which helped with marking. Only a minority of candidates correctly identified the graph as a histogram with many confusing it with a bar chart. While some candidates secured full marks in Parts (a) (iv) and (b), examples of continuous and discontinuous variation were often mixed up.
- Q5** The responses to this question proved to be very disappointing in terms of both biological content and quality of written communication. Some candidates did not correctly identify Alexander Fleming as the scientist responsible for the discovery of penicillin. Many candidates confused the role of bacteria and the fungus and very few explained the fungus produced a chemical (antibiotic) which then diffused through the agar to kill bacteria or inhibit their growth.

The names Florey and Chain were not well known by many candidates.

- Q6** In Parts (a) (i) and (ii), most candidates were able to correctly read the graph and attain full marks in these questions.

In Part (b) (i), it was encouraging to see that most candidates were able to read the pulse rate from the graph and correctly record the units in their answer.

In Part (b) (ii), the full range of marks (0 – 4) was achieved. Marks were frequently lost for failing to link exercise to an increased need for energy and therefore respiration. In this respect, this proved to be an effective discriminating question.

Q7 In Part (a) (i), many candidates lost marks for vague answers, referring to the positioning of the needle rather than the potential damage it could do to the foetus.

In Part (a) (ii), some candidates understood that miscarriage was a potential risk associated with the amniocentesis procedure, but few were able to suggest infection or leakage as alternative answers.

In Part (b), a common misconception among candidates seems to be that all 46 chromosomes are Xs or Ys. Answers which suggested these chromosomes were from a male because the chromosomes were all Ys were penalised. Equally, marks were not awarded for general statements that males are XY and females XX with no reference to the diagram.

Part (b) (ii) demanded a comparison between a person with Klinefelter's syndrome and one without. Unfortunately, many candidates did not attempt any sort of comparison and lost the mark.

In Part (b) (iii), most candidates were cognisant of the ethical dilemmas facing parents following a positive diagnosis.

Q8 Many candidates struggled to explain what is meant by a dominant allele.

The calculation and the Punnett square were well done, though a disappointing number of candidates were able to correctly describe the genotype as heterozygous.

In Part (e), candidates were expected to compare the actual results with the theoretical outcomes from the Punnett square. Many did not obtain full marks in Part (e) because they did not include data in their answer.

Q9 Overall, candidates demonstrated a good knowledge of this topic. The ways bacteria can enter the body were well known.

The drawings were often very good, although some candidates lost marks in Part (b) (iii) for using the word destroy, which was in the stem of the question, rather than the term digest.

Many candidates were able to identify lymphocytes as the other white blood cell, but their mode of action was less well known.

In Part (d) (i), the waxy cuticle was often wrongly identified as the upper epidermis, though its function in defence was frequently described correctly.

In Part (d) (ii), the mark was not awarded for reference to guard cells, thick membrane or cellulose cell walls without qualifying the walls as thick.

In Part (e), foxglove as the plant which produces digitalis was rarely seen. A wide variety of plants were incorrectly named, daffodils being the most common.

Q10 The calculation was well done and most candidates knew the cause of skin cancer was exposure to sunlight or UV radiation.

In Part (b), full marks were not secured by many candidates. While cancer was correctly described as uncontrolled cell division by the majority of candidates, some did not link this to UV radiation/sunlight causing mutations.

The treatments for cancer were well known.

Q11 The calculation was well done, with many candidates achieving two marks out of the three available.

In Part (b), the risk factors and their prevention were well understood. Nearly all the candidates related their answer to the table.

Part (c) posed the most difficulties, many confusing the roles of aspirin and statins.

Higher Tier

Unit Overview

Overall, a good candidate performance in this paper with a high proportion scoring high marks. The paper provided candidates of differing abilities to demonstrate their knowledge and understanding. The variety of skills and knowledge-based questions provided good differentiation in candidate performance, resulting in a wide range of marks.

Q1 A disappointing number of candidates were unable to calculate a percentage, although most understood the risk factors associated with skin cancer. A small number, however, lost a mark for not referencing that the farming and forestry workers spent more time outside.

In Part (b), most candidates were able to describe cancer as abnormal cell division, but similar to foundation tier, the link with UV radiation/sunlight causing mutations was often omitted. As a result, the question proved to be a useful discriminator.

Cancer treatments were well known.

Overall, a good opening question based on a frequently examined topic, which allowed all candidates to access marks at the beginning of a traditionally challenging paper.

Q2 There was evidence to suggest that some candidates are not confident working with large numbers, the numerator and denominator were often interchanged in the calculation in Part (a).

The risk factors for heart attacks and ways of reducing the risks were well known with many candidates linking their answers to the table.

Less well understood was the role of aspirin and statins in the treatment of cardiovascular disease, the mode of action of these two drugs being often confused. The use of aspirin in the treatment of other ailments, not relevant to the question, was a frequent mistake.

Q3 Many candidates demonstrated a good knowledge of this topic. The terms osmosis and plasmolysis were well known by most, although sometimes spelled incorrectly. Some candidates, however, used the word flaccid instead of plasmolysed.

Observational skills were generally well used to identify changes which occurred when a plasmolysed cell is placed in water, although some candidate answers lacked sufficient detail, resulting in a loss of marks.

In Part (d), the descriptions and explanations of haemolysis were, on the whole, accurate.

- Q4** The renal artery and hepatic vein were often and surprisingly mis-identified. Some candidates simply mixed them up or gave completely wrong answers.

In Part (b), the position of the hepatic portal vein and the direction of blood flow in the pulmonary vein were correctly drawn by most candidates, but arrows drawn in the wrong direction and labelling lines not touching the small intestine and liver boxes were the most common mistakes.

In Part (c), a good knowledge of the structure and function of the pulmonary vein and vena cava was generally demonstrated. In Part (c) (ii), however, some candidates did not read the question carefully enough and lost the mark by focusing on a structural difference rather than the composition of blood in the two blood vessels.

- Q5** The types of contraception were well known by the majority of candidates, although how they worked proved discriminatory with some incorrect answers. A number of candidates did not read question stem carefully enough and were penalised for descriptions of male contraception methods.

Most candidates secured full marks by providing correct descriptions of the data in Table 2 and suggestions how the contraceptive pill may be incorrectly used. Making no reference to how improper use of the contraceptive pill impacted on the number of pregnancies was overlooked by some candidates, however, resulting in the loss of a mark.

In Part (c), a significant number of candidates were unable to take accurate readings from the graph and failed to recognize that these values were actually in 'thousands' of women.

Most candidates were able to suggest reasonable explanations for the move towards the use of implants and almost all gave a correct comparison to the change in numbers using the contraceptive pill and condoms.

- Q6** It was very encouraging that many candidates were able to apply their knowledge and understanding of heart structure and function to the unfamiliar context in this question.

The 'hole in the heart' was well identified and its impact on blood flow and pressure was generally well described. Many candidates used their knowledge and understanding to suggest why blood flows from the left ventricle to the right ventricle and not vice versa.

In Part (c), the aorta was often correctly identified and many obtained at least one mark for suggesting how the condition could affect pressure in the aorta.

In Part (d), while many described the reduction in oxygen reaching the tissues, only some linked this to respiration. Paleness was often incorrectly attributed to a lack of iron or haemoglobin rather than a lack of blood flow to the skin.

Q7 This question was generally well answered, but some candidates found Parts (a) (iii) and (iv) challenging.

Most candidates identified a fungus as the type of microorganism which produces penicillin. It was encouraging that some knew the name of the fungus, *Penicillium*.

A common mistake by some candidates was incorrectly stating 'bacteria', but ECF prevented them being penalised further in Part (a) (iii).

Descriptions of the function of the stirrer were often too vague and only those who described the mixing of the microorganism with the nutrients or air secured the mark.

In Part (a) (iii), vague references to preventing contamination were not accepted.

In Part (a) (iv), most candidates correctly described the increase in temperature in the fermenter, but only a minority linked this to the process of respiration. Some candidates lost marks by focusing on the function of the water jacket in controlling the temperature and keeping it constant.

In Part (b), the process of downstreaming was well described by the majority of candidates.

Q8 Typical of most genetics questions, most candidates demonstrate a good knowledge of the topic and this question was no exception. Some mistakes made which resulted in a loss of some marks are worth noting for future reference.

In Part (a), some candidates still confuse the terms genotype and phenotype.

Part (b) proved challenging, but provided some discrimination and differentiation. Many candidates correctly identified the parents as carriers, but some explanations why cystic fibrosis is a recessive condition did not include that affected children receive a recessive allele from both parents.

The terms 'allele' and 'gene' continue to be confused by some candidates.

In Part (c), the Punnett square was completed successfully by most candidates. Common mistakes included giving the gametes as sex-linked despite being provided with a recessive gamete and some candidates, having correctly labelled the gametes, completed the diagram incorrectly.

In Part (c) (ii), giving the answer as a ratio was penalised.

Q9 The causes of female infertility were familiar to most candidates, although, the quality of QWC was sometimes poor. A greater proportion of candidates than usual were unable to write coherently using two or more sentences with proper punctuation.

The benefits of freezing embryos for future use were well described and the majority of candidates were able to correctly interpret and explain the data on IVF success rates.

Q10 In the final question a frequently asked topic was, once again, examined in an unfamiliar context.

In Part (a), most candidates obtained the mark for describing an appropriate method of infection.

While the passive transfer of antibodies in the colostrum was well understood, a significant number of candidates did not carefully study the graph provided or read the question properly. They described the transfer of antibodies across the placenta instead of focusing on the transfer shortly after birth. This was not rewarded as the graph clearly showed the antibody level rising from zero shortly after birth.

Part (b) (iii), again, required candidates to carefully study the graph rather than just give textbook answers. Since the gradient of the line was the same for each vaccine, describing the second response as faster was not accepted. Precision is expected when interpreting evidence at this stage in the paper.

In Part (b) (iv), the theory of how the second dose of the vaccine affected the antibody level was generally well known, although not explaining that the memory lymphocytes/cells were produced as a result of the first dose was a common error.

In Part (b) (v), many candidates were able to use the information on the graph to explain the need for the booster to prevent the antibody level falling below the immune threshold.

Assessment Unit 3

Practical Skills

Booklet A

Foundation Tier

Unit Overview

Similar to 2022, the candidature was small. Despite this, however, a range of marks was still obtained indicating that the candidates were able to access the questions with differing success. It also reflected the differentiation evident in the questions. It could be argued that, if better prepared, the candidates could have responded even more positively to the questions asked in the paper. Reading instructions carefully is of paramount importance in this paper.

Task 1

- Q1**
- (a)** This question was generally well answered. Some common mistakes included measuring the mass of potato to more than one decimal place and including units in the main body of the table, the latter being point that still requires some addressing.
 - (b)** Most candidates were able to secure this mark, although a small minority incorrectly answered the change in mass.
 - (c)** This question was well answered with most candidates achieving two or three of the marks available. It was clear that candidates knew this aspect of the experiment well and had carried it out as one of the prescribed practicals.
 - (d)** The positive response to this difficult question was very encouraging, with many candidates correctly identifying that the excess water/solution would affect the accuracy of the mass being recorded.

- (e) The mark scheme allowed candidates to still access the marks offered in this question even if their experiment did not work correctly or they miscalculated their change in mass. Some candidates demonstrated a good knowledge of osmosis and achieved two or three marks. Those who didn't, often explained their result without offering a description. Scaffolding was in place to help candidates ensure they included a description and an explanation as part of their answer.
- (f) Graphs were generally well drawn, although a small number of candidates still do not follow instructions carefully enough, therefore losing marks by plotting inaccurate points or not joining the points together.
- (g) Some varied answers evident in this question, suggesting the scale was not read carefully rather than a lack of knowledge regarding the significance of the line crossing the x-axis. Applying ECF to this question allowed candidates to achieve this mark even if their lines were not plotted correctly.

Task 2

- Q1** The full range of marks were obtained in this question. While some candidates showed a good understanding of how to focus a microscope, others did not. The latter provided a vague method and did not make reference to parts of the microscope to describe the steps.
- (a) This question was well answered, with many candidates securing the two marks on offer.
 - (b) This question was also well answered, with many candidates securing the two marks on offer.
 - (c) Some candidates made a good attempt at drawing the cell, but drawing skills overall need some refinement. The line style was not appropriate with the result that lines were sketchy. Also, some candidates drew a textbook style diagram of a plant cell rather than a representation of the cell in the photograph as instructed. This will not be the last time candidates will be asked to make a drawing, so some attention needs to be given to improving drawing skills so candidates can maximise the marks available.
 - (d) This question proved to be a good discriminator. Most candidates correctly measured the length of the line XY. Only the more able candidates were able to go on and correctly calculate the actual width of the cell.

Booklet B

Foundation Tier

Unit Overview

In this paper, a small number of candidates of differing abilities again were provided with the opportunity to demonstrate a variety of practical based skills and apply relevant knowledge to respond positively to the questions posed. Good differentiation was evident with a wide range of marks achieved.

Q1 Producing a solution of the biscuit was well described with candidates making good use of the pictures as a helpful prompt. Some candidates adding water to the crushed biscuit in the mortar was sometimes described as an alternative to adding the water to the biscuit in the test tube.

Various pieces of apparatus were stated, indicating that nearly all the candidates had experience of seeing or using them.

Whilst Benedict's was generally well known in Part (c), the description of the colour change was sometimes inaccurate or mixed up with other food test results.

Candidates displayed a very good knowledge and awareness regarding safety precautions, often highlighting the use of safety goggles and gloves as well as the careful handling of glassware to prevent cuts and burns.

Q2 Methods of measuring heart rate were well known. Most candidates correctly calculated the average increase in heart rate, but some mistakenly divided by 30 and not 5.

In Part (c), the reasons why pupil C was the least fit were well described. Once again, it was encouraging to see comparative language being well used.

The effects of exercise on breathing were also well known.

Q3 Details of how to destarch a plant were well known, but the function of sodium hydroxide was not. While many candidates identified starch being present in plant B, only a minority linked this to the presence of water/absence of sodium hydroxide.

Most candidates were familiar with the method of testing a leaf for starch in Part (b).

Q4 The function of the water bath was well known. In Part (b), the letters of the experiment were sometimes mixed up. The correct pH was correctly identified by most candidates.

While many candidates identified that starch was still present at pH 2, they did not link this to acidity or denaturation of the enzyme.

Surprisingly, sugar being produced when amylase breaks down starch was not well known by many candidates.

Q5 Most candidates demonstrated some knowledge of aseptic techniques, although Parts (c) and (d) were poorly answered.

Q6 The potometer was correctly identified by most candidates, although specific details were vague such as the function of the syringe.

Some candidates were unfamiliar with how to create humid conditions experimentally and the effect of humidity on transpiration.

Most candidates were able to offer another factor in Part (c).

Q7 The calculation was generally well done. Most candidates demonstrated some knowledge of diffusion, linking it to correctly to this experiment.

Higher Tier

Unit Overview

This paper contained a range of questions that allowed candidates of varying ability to access marks. A greater range of marks was obtained compared to previous years, highlighting, perhaps, a lack of candidate experience in some practical areas of the specification.

Task 1

- Q1**
- (a)** This was a straightforward question, but still provided some differentiation. Instruction 6 required candidates to record their results to one decimal place. Results recorded to two decimal places or as whole numbers were therefore penalised. Candidates who used the wrong sign when calculating the changes in mass also lost marks.
 - (b)** Some candidates were able to successfully access the marks in this question, but others used the final mass rather than the initial mass as the denominator, so therefore lost a mark in the calculation.
 - (c)** Most candidates were able to correctly identify the dependent variable. Some, however, stated incorrect answers such as length of the potato cylinders and concentration of the sucrose solution.
 - (d)** The effect of surface area on the rate of osmosis was generally well understood.
 - (e)** While some candidates suggested that calculating percentage change made the results more reliable or accurate, most appreciated it was necessary because the potato cylinders were different masses to begin with and so could not be directly compared.
 - (f)** Overall, the graphs were drawn to a good standard, particularly the scaling of the y-axis. Some candidates, however, lost marks for not plotting points to the required level of accuracy and not ruling the line accurately through the points.
 - (g)** As with plotting points, candidates are expected to be able to take accurate readings from a graph. Unfortunately, not all candidates were able to do this. ECF applied did allow some candidates, who drew their graph incorrectly, to access this mark.

Most were able to describe that the concentrations were equal where the line crossed the x-axis, but few explained that this resulted in no change in mass because there was no net osmosis.

Task 2

- Q1 (a)** Most candidates appreciated that a single layer of cells was used because it was thin, but a disappointing number explained that this was necessary to allow light to pass through. Staining the onion cells with iodine solution to make them more visible was well known. Many good explanations of gently lowering the coverslip to exclude air bubbles were given, but only some candidates went on to describe the role of the coverslip in preventing the tissue drying out. As a result, this proved to be an unexpected discriminatory question.
- (b)** Drawing is an important scientific skill. Drawings should have a representative shape and lines should be continuous and neat, but not sketchy. Some candidates lost marks for drawing text-book diagrams of a plant cell which contained organelles not visible in the photograph, others were penalised for poor quality, broken lines or having a nucleus drawn in the wrong place. In Part (ii), marks were lost for drawing a labelling line which did not touch the organelle. Candidates need to be provided with more opportunities to refine their drawing skills.
- (c)** While some candidates were well prepared for this question, the magnification calculation presented difficulties for others. The first mark was for accurately measuring the length of the cell to within 1mm of error. The second mark, for converting the measurement to micrometres, proved more difficult for those who measured in cm instead of the SI unit mm. Many who measured in cm multiplied by 1000, thus losing the conversion mark.

Most candidates obtained the third mark for dividing by the magnification, though a small number multiplied by 1500, rather than dividing. Some candidates find it challenging to rearrange mathematical formulae, substitute in values and arrive at a correct answer. This is clearly another skill which requires more practice and refinement.

Booklet B

Higher Tier

Unit Overview

In this paper, candidates were provided with the opportunity to demonstrate a variety of skills and respond positively to the practical-based questions asked. Some discriminatory questions allowed for differentiation and subsequently, a wide range of marks.

There were some disappointing performances, however, most notably in describing a simple investigation into phototropism. This may have been a consequence of a lack of practical experience in this area of the specification.

Similar to the other papers, the quality of written communication was somewhat disappointing and not up to the usual higher standard of previous years.

Q1 Most candidates were able to correctly identify the potometer and explain why the bubble moves towards the leafy shoot, but some were not clear regarding the function of the syringe.

In Part (a) (iv), the majority of candidates realised that a stop-clock or alternative timing device was necessary to work out the rate of bubble movement. Some, however, stated a ruler or scale even though one was clearly visible in the diagram.

In Part (b), a significant number of candidates were unable to explain how humid conditions can be created and some thought that increasing humidity would increase the rate of transpiration.

Most candidates correctly gave other factors which could have been investigated using a potometer.

Q2 The table heading and calculation were generally well done, although marks were dropped by some who did not state that results should be averaged after repeating to improve reliability.

In Part (c), a good knowledge of diffusion in the context of this experiment was demonstrated by most candidates, although a significant number did not obtain full marks. Some candidates thought that the increase in temperature increased enzyme activity and others lost a mark for making a vague reference to kinetic energy without explaining its significance at a molecular level. Only a small number of candidates recognised that iodine diffusing through the starch agar would cause it to turn blue-black.

Accurate use of available data was widespread among the candidature.

Like other QWC questions in this suite of papers, the standard had dropped this year. Writing coherent prose is a skill which candidates would benefit from getting to practice.

Q3 A large number of candidates correctly identified protease as the enzyme which breaks down protein, although amylase was the most common incorrect answer.

The function of the water bath in maintaining an optimum temperature was not always described clearly, simple references to heating solutions was not rewarded.

In Part (c), the main trend was often clearly identified, although not making reference to the time levelling out after enzyme concentrations of 5% was common.

The explanation of the trend provided very differentiated responses. Surprisingly, few explained that more active sites would become available resulting in more enzyme-substrate complexes forming. Only some candidates correctly explained that the time levels off when all the protein has been broken down or the substrate concentration becomes the limiting factor. As a result, this part of the question was an effective discriminator.

Q4 In Part (a), most candidates correctly named carbon dioxide.

In Part (b), the trend was often well described, but in Part (ii), reference was not always made to respiration. Some candidates also focused on glucose releasing the most energy rather than the increased gas production causing the change in the height of the gas column.

In Part (c), some candidates thought that starch had to be sterilised, boiled or added to iodine rather than simply broken down.

In Part (d), increased temperature and alcohol were common correct answers. Less common, however, was the idea that glucose would be used up and the yeast population would increase.

Q5 This question was designed to test graphical skills in an unfamiliar context.

In Part (a), a number of candidates read off the peak volume and did not subtract the lower volume.

Most appreciated that exercise increased the volume of each breath and gave appropriate data to support their answer. Most candidates then displayed a good knowledge of explaining why the volume of each breath increased because of exercise.

In Part (d), marks were often lost for inaccurate counting of the breaths or the time, although most recognised that exercise increased the breathing rate.

In Part (e), a number of candidates were not credited for giving long term effects of exercise rather than describing changes which occur during the exercise period.

Q6 The colour changes were well known, but the name of the indicator was not. Incorrect answers given included iodine, Benedict's, litmus, universal indicator and phenolphthalein.

When explaining the results for tube A, only a minority appreciated that both the leaf and insects respire, some also lost marks for comparing the level of carbon dioxide with the level of oxygen rather than comparing carbon dioxide used with carbon dioxide produced.

Explanations for tube D were often correct with many candidates securing three or four marks.

Most candidates obtained the two marks available, although some thought the insects would run out of food within the hour.

Q7 The method of setting up this experiment to investigate phototropism was poorly answered with only a minority of candidates securing full marks.

A range of controlled variables were offered as correct answers in Part (a) (ii).

While a large number of candidates correctly described the difference in appearance of the two sets of seedlings in Part (b), some lost marks because they did not specifically refer to the petri dish and lighting conditions they were describing.

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