

GCSE



Chief Examiner's Report
Biology

Summer Series 2019



Foreword

This booklet outlines the performance of candidates in all aspects of this specification for the Summer 2019 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.

Contents

Assessment Unit 1	Cells, Living Processes and Biodiversity	3
Assessment Unit 2	Body Systems, Genetics, Microorganisms and Health	8
Assessment Unit 3	Practical Skills	14
Contact details		21

GCSE BIOLOGY

Chief Examiner's Report

Assessment Unit 1 Cells, Living Processes and Biodiversity

Foundation Tier

Overall, the candidates performed well on the paper, answering all the questions and securing a good range of marks, with some candidates achieving high marks. The majority of candidates were able to respond positively to the questions posed. There was a good range of questions covering different topics and the range of answers indicated a good differentiation in the questions.

It was commented that the use of diagrams and the layout of the paper was effective in providing guidance for candidates and helping them to access the questions.

There appeared to be no sign of questions at the end of the paper unanswered indicating that the length of the paper was good.

Overall, the quality of grammar and the legibility of handwriting was good.

Q1 Candidates demonstrated a sound knowledge of energy flow although many candidates failed to add arrows to the food chain in Part (d). Some differentiation was also achieved by a range of answers obtained for the number of trophic levels in Part (c), these ranging from 3-5.

Q2 Candidates demonstrated a good knowledge of cells in this question and it was generally well answered. Some candidates lost marks in Part (b), probably by not reading the question carefully enough. They focused on the appearance of the animal and bacterial cells rather than differences in their structures. It was pleasing to see foundation candidates familiar with terms such as plasmids and non-cellulose cell wall.

Q3 Parts (a) and (b) were well answered. Part (b)(ii) provided some differentiation with only the better candidates scoring full marks. Many seemed to mix up the term "contract" and "relax". Some did not include how the diaphragm moved during the process of breathing in. Others mixed up the changes which occur during breathing in and breathing out.

Q4 Whilst this question was generally well answered, there were some candidates who did not read Part (b) carefully enough and focused on the differences in the structure and shape of the cells rather than their contents.

It was surprising to notice the number of candidates who did not know the equation for photosynthesis with some confusing the raw materials and the products.

Q5 Only a small number of candidates scored full marks in Part (a), indicating a lack of knowledge of this topic or an unfamiliarity with the "key" approach to the question. It was evident that many candidates could not distinguish simple and complex carbohydrates.

Part (b) was generally well answered, although some candidates did not draw 2 lines from fats to glycerol and fatty acids. As a result, this proved to be an effective discriminatory question.

- Q6** Overall, this question was well answered although there was some inaccuracy with incorrect terms used for response in Part (b).
- Q7** Overall, this question was well answered including the maths element in Part (b)(i).
- Q8** Many candidates were knowledgeable about the need for digestion. However, there were a variety of answers for Part (b)(ii) with many candidates not linking their answers to surface area. As a result, this answer appeared regularly in Part (iii). The adaptations of the ileum remains a challenge for less able candidates.
- Q9** Very few answered Part (a) correctly. Part (b) was well answered and proved very accessible to candidates of all abilities with a significant number of high marks scored. The quality of QWC was generally very good.
- Q10** Part (a) proved effective in getting candidates to read the question carefully and answering to appropriate decimal places.

Many candidates need to improve their examination technique in respect of using the term “more” appropriately. Some candidates lost a mark in Part (c), having accurately described why biodiversity could be affected, they did not include how by failing to include the term “increase”.

- Q11** The maths element in Part (a) was generally well answered and the graphs were accurately plotted.

A large number of candidates lost the mark in Part (c) by not indicating that the mass of wheat was the dependent variable.

A range of inaccurate abiotic factors were given in Part (d) with few candidates scoring 2 marks.

Part (e) proved to be a good discriminator, as many candidates did not identify the change in trend or use a comparative term with the previous plot. The term “anomaly” was seldom used. This question indicated the need for an improvement in this area of examination technique.

Higher Tier

This paper allowed candidates of differing abilities to respond positively to the questions posed. The different styles of questions asked in the paper gave all candidates an opportunity to demonstrate their knowledge and understanding of the different areas of the specification. The more challenging questions enabled the very able candidates to respond well and attain higher marks. As a result, a wide range of scores were achieved by the candidates this year.

- Q1** In Part (a) most candidates were able to read the scale of the graph accurately and calculate the total mass and the percentage correctly. Any error in Part (i) was carried forward thus allowing the candidate to gain marks in (ii) for demonstrating competency in different mathematical skills. However, some candidates did not give their percentage to one decimal place as required and could only be awarded 1 mark when the correct working out was shown. In Part (b) only about two thirds of the candidates fully explained why planting more trees reduces the mass of carbon dioxide; marks were most frequently lost for confusing the processes of photosynthesis and respiration. Very few candidates scored both marks in Part (c). Many did not describe how planting trees affects biodiversity. Vague answers such as ‘affects’ or ‘changes’ in biodiversity were not accepted.

Q2 In Part (a) a surprisingly large number of candidates were not able to complete the calculation for this question. The information needed to carry out the calculation was given at the beginning of the question. Either candidates did not know how to do the calculation (divide by 100) or did not read the information provided. Candidates should be encouraged to read questions carefully.

In Part (b) only a few careless mistakes were made with plotting and most candidates used a ruled line thereby gaining all 3 marks.

In Part (c) only about 50% of the candidates described the relationship correctly: a notable number did not include wheat as the dependent variable in their description. A common response was “as the mass of wheat increases, the mass of weeds decreases”. This places wheat as the independent variable and weeds as the dependent variable and is therefore incorrect.

In Part (d) candidates sometimes failed to pick up on this question involving competition and therefore did not identify abiotic factors that would be in short supply. Instead many candidates simply listed a number of abiotic factors, some of which would not involve competition e.g. temperature, wind. Candidates should be wary of listing more than the required number of answers: often this results in some incorrect answers being included in the list leaving examiners to choose which answers to mark. In such cases examiners will annotate the response with CON (contradiction) and will not award the mark.

In Part (e) the plot was identified, and the explanation stated successfully by most candidates though some lost a mark for failing to use evidence from the graph to support their explanation.

Q3 In Part (a) drawing an accurate, symmetrical pyramid proved problematic for many candidates. Most placed the producer at the base of the pyramid and used the key provided but some candidates had issues with scaling and keeping the three bars the same depth.

In Part (b) the advantages and disadvantages of pyramids of biomass is not well understood. Accuracy was a term frequently used and was misplaced in this context.

Q4 Many candidates could not answer Part (a), a straightforward factual recall question.

About two thirds of the candidates scored full marks in Part (b). Some did not describe the shape of the lens correctly and a number continue to lose marks for using the terms contract and relax when describing the action of the suspensory ligaments.

A surprisingly large number of candidates could not answer Part (c)(i). A common mistake was describing the optic nerve as the receptor.

Very few candidates scored full marks in this Part (c)(ii). Many correctly identified the optic nerve but failed to describe the information being carried in the form of an impulse. Vague terms such as signals, message and information were often given.

Q5 In Part (a)(i) a significant number of candidates were not familiar with the use of the term exothermic to describe a reaction that releases energy (perhaps because this is a new addition to the specification). It was sometimes confused with endothermic and sometimes simply left blank. In contrast the majority of candidates were able to describe other ways in which the energy released by respiration is used.

The table was often completed correctly in Part (b), though candidates should be made aware that a tick with a diagonal line through it will be treated as ambiguous and will not be rewarded.

Q6 In Part (a) root hair cells and their adaptations were generally well known. Not so well known was the role of magnesium as a component of chlorophyll.

In Part (b)(i) most were able to successfully compare the results for plant A and B though some candidates lost 1 mark because they did not include data to support their answer. Part (ii) proved to be a discriminating question. Many candidates scored just 1 or 2 marks for identifying that plant B had oxygen for respiration/energy. Only the very able candidates linked this to active transport and went on to describe the ions being absorbed against a concentration gradient.

Q7 In Part (a) most candidates were able to correctly identify the pancreas and liver and describe the conversion of glucose to glycogen/fat for storage. Only a small number described the increased absorption of glucose from the blood and increased respiration of glucose. Common errors were “glucose being broken down into glycogen” and glycogen being confused with glycerol or glucagon.

On many occasions in Part (b), candidates had given a correct description of negative feedback in the previous response but failed to adequately explain the term when directly asked to do so. Most obtained 1 mark for describing the role of a corrective mechanism in returning blood glucose concentration to normal but the constant monitoring of the concentration of glucose in blood was not well known.

Q8 In Part (a) many candidates successfully suggested how slurry improves the growth of crops though some were penalised for vague reference to nutrients rather than minerals/nitrates.

In Part (b) candidates were required to comment on the data given in the table with regards to increased rainfall. Appropriate terminology was needed for the second mark and this was often not given as run-off or leaching.

In Part (c) the stages of eutrophication were clearly described by most candidates, with many scoring at least three marks in this question. Eutrophication is a concept which emphasises the relationships that exist between many species in the environment. It is essential that candidates fully understand these relationships and the sequence of events involved if they are to obtain full marks for this question.

Q9 This question required an explanation and many candidates confined their responses to descriptions. Only where explanations in terms of both photosynthesis and respiration were given correctly for each of the three time zones could full marks be accessed. As a result this question was a good discriminator separating the low from mid-ability while still allowing the most able to obtain all six marks.

Q10 In Part (a), it was disappointing that so few candidates recognised enzymes as proteins. Furthermore, many candidates seemed to consider enzymes as catalysts only involved in digestion.

In Part (b) candidates are expected to be able to describe the effect on the dependent variable of increasing the independent variable. This requires them to correctly identify each variable using the labels on the axes and then use this to describe the trend over the range of the independent variable given. Incorrectly, candidates all too often described the graph as increasing. Another common error was stating ‘mass increasing’, instead of **mass of substrate broken down** increasing. Despite the poor descriptions the explanations were often comprehensive.

Calculating rates of reactions is a skill required of higher tier candidates, yet many struggled, in Part (c), to take the two necessary pieces of information from the graph. Inaccurate readings of the mass of substrate broken down were penalised.

Enzyme inhibition is not well understood (again perhaps because it is new to the specification). In explaining the action of inhibitors, it is essential that the correct enzyme terminology is used. Question (d)(ii) proved very demanding, in part because candidates did not appear to read and make use of the information given in the question stem. Only the most able candidates appreciated the significance of the relatively low proportion of inhibitor to enzyme meaning that some active sites were not blocked and so some enzymes could still work.

Assessment Unit 2 Body Systems, Genetics, Microorganisms and Health

Foundation Tier

A total of 282 candidates completed this Foundation tier paper and achieved a range of marks from 8 to 72 out of a possible 90. Some candidates showed a sound knowledge of Biology at this level while the standard of others was disappointing.

- Q1** Only a few candidates completed this question to a high standard. Many incorrectly labelled Part (d) as the sperm tube, gave the function of the testes as holding sperm rather than producing sperm and labelled the prostate gland E instead of F.
- Q2** Part 2 (a) was generally well answered. In Part (b) too many candidates gave the term 'oviduct' instead of ovary but quite a few attained full marks. Nearly all candidates answered Question (c) correctly. Question (d)(i) was answered well. Many candidates did not read this Question (d)(ii) correctly as one other secondary sexual characteristic and therefore included 'voice deepens' as well as 'muscular body' in their answers [these were in table Question 2(c)]. Also, quite a few gave hair growth which is too vague for males only.
- Q3** In Part (a)(i) candidates were required to link their knowledge to the diagrams and information in the stem of the question. Many candidates did not recognise these diagrams as blood vessels and a lot of answers were too vague describing cells with nuclei. In Part (ii) the term lumen was seen on a rare occasion with many varied answers including vein, nucleus and Y. Many candidates incorrectly labelled C instead of B in Question (b)(i). In Part (ii) the role of capillaries was rarely answered correctly. Most candidates described joining of arteries to veins and blood transport instead of exchange of materials between blood and tissues. In Part (iii) most candidates attained one mark for describing higher pressure or arteries carrying blood away from the heart.
- Q4** Part (a) of this question was generally well answered. In Part (b)(i) most candidates who mentioned cuticle described it as waxy. In Part (ii) many candidates were able to correctly draw the arrow through the stoma but very few extended it close enough to the palisade layer cell as mentioned in the question. It seemed that very few candidates read the stem of the Question (c) as many answers were too vague and very few correct answers were observed. In Part (d) many candidates attained at least one mark but too many described antibody production which does not prevent the entry of microorganisms.
- Q5** In Part (a)(i) most candidates could name the structure as a chromosome. There were very few correct answers for Part (ii) as most candidates described cell division or fertilisation. A few candidates correctly answered Part (iii) this but most did not mention genetically identical. In Part (b), very few candidates could give growth as the other role of mitosis.
- Q6** Parts (a) and (c) were well answered. In Part (b) most candidates correctly circled virus but quite a few thought flu was caused by bacteria. In Part (d)(i), most candidates correctly described the relationship between the percentage of children vaccinated and the number with the flu. The calculation in Part (ii) was generally well done with most candidates attaining 2 marks. In Part (iii), the majority of candidates attained at least one mark with many describing a modified virus present in the vaccine which causes antibody production.

- Q7** In Part (a)(i) nearly all candidates gave the correct time when the cell was fully plasmolysed. Question (ii) was poorly answered as many candidates did not include the correct terminology. In Part (b)(i) most candidates gave the correct term, osmosis. There were a few correct answers for Part (ii) but the majority of candidates incorrectly described osmosis as water moving from a high concentration to a low concentration.
- Q8** In Part (a) very few candidates could describe an allele as a different form of a gene. In Part (b) the genotype was given correctly in most answers. In Part (c) most candidates attained at least one mark with many unable to describe the phenotype correctly. In Parts (d)(i) and (iii) most candidates correctly completed the Punnett square and gave the correct ratio.
- Q9** The drawing of the bar graph in Part (a) was excellent with nearly all candidates attaining full marks. There were some very good answers for Part (b) but quite a lot of the descriptions were too vague. Part (c) proved to be a very difficult question as most answers lacked sufficient detail to attain a mark. Nearly all candidates correctly answered Part (d) giving genetic and environmental factors.
- Q10** This was a straightforward recall question and most candidates attained at least 4 marks. Most candidates described tar and nicotine correctly but many answers included rat poison as a harmful chemical. The overall standard of QWC was good.
- Q11** In Part (a) most candidates were able to describe cancer correctly as uncontrolled cell division. It seemed that many candidates misread Question (b) or did not understand the term 'structure' describing cancer cells moving into the blood and too many described the cell wall instead of membrane. In Parts (c)(i) and (ii) nearly all correct answers were attained. Part (iii) was generally well answered. In Part (d) there were a few 2 mark answers but the majority of answers were too vague.
- Q12** Parts (a)(i) and (ii) were generally well answered. Part (iii) proved difficult for some candidates as they did not understand the term 'part of a cell' and many named chromosomes instead of nucleus. In Part (iv) there were very few correct answers to this question with a lot of candidates describing male and female gametes fusing and mixing of genes instead of base sequences. In Part (b)(i) only a few candidates correctly calculated the percentage of bases. In Part (ii) most candidates achieved one mark for the conclusions from the table.

Higher Tier

The definition of cancer is well known, and many candidates have the skills necessary to identify the differences in chromosome diagrams. There is some confusion however in the purpose of screening programmes.

The structure of DNA is also well known but the detail of the proportions of the bases was patchy. The skill of drawing conclusions from the data was at times inaccurate.

Many candidates have a good knowledge of the blood vessels entering and leaving the major organs. There was however evidence of weak examination technique and carelessness when some candidates tried to compare the contents of the blood vessels.

Although the amniotic fluid was well known, some candidates found it difficult to identify the basic structures of the foetus in the uterus.

While assessment of the new understanding of how sperm move was well revised by candidates, there continues to be inaccuracies in the language used to describe fertilisation. Candidates are also confused between what happens to the zygote before and after it reaches the uterus.

Candidates appeared for the most part to have been well prepared and showed good understanding of Huntington's disease, also a new addition to the specification.

When explaining the effects of exercise on the body examiners were disappointed by the many responses which excluded a basic understanding that muscles contract.

Other answers showed a lack of focus, particularly when asked to define active immunity, relying on a full explanation of how immune system deals with a bacterial infection.

The skill of accurately describing and explaining changes in a graph using appropriate scientific language posed significant problems for some.

- Q1**
- (a)** The vast majority of candidates scored full marks on the definition of cancer by using the expected terminology. Some confused 'mutation' for abnormal or uncontrolled and more commonly 'growth' for cell division.
 - (b)** The size of the nuclei, the thickness of the cell membranes as well as the shape of the two cell types were clearly identified as structural differences by many when looking at the diagram. Some however referred to 'cell wall' or size differences while others ignored the 'structure' and described how the cancer cells could move into the blood stream.
 - (c)**
 - (i)** The presence of XY chromosomes or a Y chromosome in the drawings was recognised by nearly all as evidence of the male. A small number referred to a Y gene or cell.
 - (ii)** Very few candidates failed to identify the chromosome pairs that differed in the cancer cell.
 - (iii)** The role of mutations in cancer was again well known.
 - (d)** The importance of screening programmes for cancer highlighted some confusion in the understanding of the candidates. Screening detects the presence of cancer, its location but more detailed tests, scans, etc. are necessary to identify the type and whether it is benign or malignant, as well as the type of treatment required. Screening does not stop the cancer spreading, however if done early enough may catch the cancer before it spreads.
- Q2**
- (a)**
 - (i)** The term describing the shape of the DNA molecule was recalled by nearly all.
 - (ii)** Fewer recalled the molecules making up the backbone of DNA. Some thought the sugar was glucose while others, named the four base molecules or proteins and amino acids.
 - (iii)** The part of the cell containing DNA was well known.
 - (iv)** The description given by a large proportion of the candidates did not focus on the sequence of bases but on the genes and alleles that they inherit from their parents.
 - (b)**
 - (i)** Although a significant number of the candidates calculated all three percentages correctly, most of the others failed to score. A few recognised that cytosine and guanine should be equal but were unable to work out the arithmetic for adenine and thymine.
 - (ii)** A common error when stating conclusions was that they did not apply to all four of the organisms. One frequent wrong answer which did apply to all four was that cytosine was the least in each organism.
- Q3**
- (a)** The names of blood vessels A, B and C were generally well known, particularly vessel A. Some mixed up arteries and veins, and others labelled C as the vena cava.

- (b)** This question demonstrated several examples of poor examination technique. Firstly, some responses referred to only one of the vessels, either A or C when each of the two numbered differences should reference both. The mark scheme did allow one mark if difference 1 was “A is oxygenated” and difference 2 “C is deoxygenated”. Secondly, not answering the question asked either resulted in a comparison of A and B or did not focus on the composition of the blood, describing pressure or direction of flow differences.
- (c)** Many responses were inadequate in at least one of the two points required. Even though the absorption of digested food molecules is emphasised in both Unit 1 and 2, the contents of the blood in the hepatic portal vein were poorly described. The commonest reason for losing the second point was no reference to the blood coming from the small intestine.
- (d)** Examiners were disappointed by the lack of clarity in many definitions of a double circulation, with “round the body twice” being a common error.
- Q4 (a) (i)** Nearly all the candidates recognised the placenta, but the other two parts causes more problems. Many mistook the uterus lining for the uterus wall and likewise the vagina was often labelled the cervix.
- (ii)** The amniotic fluid and its function was well known.
- (b)** Carbon dioxide was correct in most scripts but there was more diversity as to the answers for the second waste substance, including urine, excretion and faeces.
- Q5 (a) (i)** Although a pleasing proportion of the candidature used the term ‘flagellum’, now detailed in the specification, there was a residual ‘tail’ still using Key Stage 3 terminology.
- (ii)** Again a good proportion of the candidates knew that respiration in the mitochondria of the sperm released the energy to move the flagellum.
- (b) (i)** Many answers showed some degree of understanding of fertilisation but because the failed to mention the fact that it involves the nuclei which fuse, often scored only half of the marks available.
- (ii)** A small fraction of candidates referred to the zygote as the embryo.
- (iii)** The responses to this question often included what happens in the uterus (implantation), rather than in the oviduct. Not all of those who knew it was cell division included mitosis in their answer, some referring simply to growth.
- Q6 (a)** This was quite an easy start to the question with a wide range of alternatives from which the majority of candidates were able to select three.
- (b) (i)** There were many correct answers, but a few were just too vague.
- (ii)** Even though the diagram did show fertilisation as the next stage in the process many candidates did not appreciate that removing several ova increases the chance of fertilisation. Instead answers often discussed improved implantation or pregnancy.
- (c) (i)** Although some candidates continue to be confused between the uterus wall and its lining, the largest problem is that many could not find alternative words to describe the act of implantation. Following on from 5(b)(iii) above, a few described the zygote as implanting which then divides into an embryo.
- (ii)** The understanding of the new term ‘differentiation’ was limited.

- Q7 (a)** Vague references to muscles ‘working harder’ instead of contracting was the major reason why many candidates did not achieve full marks in this question.
- (b) (i)** A significant proportion of the candidature did not read the question or understand the full question. They only used the formula to complete the table and did not subtract their calculated cardiac output from the one given for before the fitness programme to calculate the change.
- (ii)** As in Part (a) some answers were too vague, explaining that the heart become stronger rather than the heart muscles strengthen.
- Q8 (a)** The spread of whooping cough bacteria in water droplets through coughing and sneezing was well known.
- (b) (i)** Although the point about the body actively producing its own antibodies was made in many answers, it was often buried in excessively extensive answers describing the action of both lymphocytes and phagocytes, some of which overlapped with the next question.
- (ii)** Notwithstanding the few candidates who lost the mark by referring to the whooping cough virus, the presence of dead, weakened or attenuated version of the bacterium in the vaccine was well known.
- (c) (i)** Many candidates found this skill a major task. The decrease in the number of children with whooping cough caused by both V1 and V2 was obvious to most but, a much smaller number described the larger decrease by V1 as a difference. Describing a second difference was the greatest challenge as it required a comparison of either the rate at which the vaccinations caused the drop, or the time taken to cause the drop in numbers.
- (ii)** Many correctly recognised V2 and V3 as booster vaccinations.
- (iii)** A substantial proportion found it difficult to express their understanding of the advantages of booster vaccinations in a scientific way.
- (iv)** Again, candidates found it difficult to suggest a reason using appropriate terms.
- Q9 (a) (i)** Apart from a noteworthy proportion of the candidates who confused Huntington’s with haemophilia, believing it to be sex-linked and the even smaller number who described the phenotype rather than the genotype, most scored full marks.
- (ii)** As in previous years candidates continue to find this type of question challenging. The most important aspect of any points made is that they should include references to the alleles transferred from the individual parents to the children. In this case answers often did not include the role of the father in providing the ‘h’ (normal) allele.
- (b) (i)** A discouraging number of candidates responded vaguely to the definition of genome.
- (ii)** Although the spelling of some answers left much to be desired, the majority attained this mark.
- (iii)** Most candidates have a good understanding of the ethical issues involved.
- Q10 (a)** Most candidates were able to complete the table correctly, but some were vague about preclinical trials.
- (b) (i)** Also well answered.

- (ii) Answers to the reason for preclinical trials showed some confusion in that only the minority understood this to test the toxicity of the drug, while many suggested it was to identify side effects. Side effects can only be identified when the drugs are tested on humans.
 - (c) The importance of the optimum dose was well understood by the majority, particularly the risk of too much causing an overdose. Some answers did not however include an explanation that a less than optimal dose would be ineffective.
 - (d) A disappointing proportion of the candidates showed only a vague understanding of peer review stating that it should be carried out by 'other people' rather than by scientists of a similar standing.
- Q11**
- (a) Nearly all candidates realised that tawny owls increased because they were able to see and access more lemmings as food.
 - (b) Very well answered by those who read the question correctly. A large number of candidates clearly understood the process of natural selection but scored poorly (if at all) because they discussed what would happen when snow depth increases/is high. This meant a lot of irrelevant information was written about the light grey tawny owls rather than the brown ones or what happens to the brown owls when there is a lot of snow.
 - (c) Although many were able to link global warming to decreasing snow depth and cause a decrease in the light grey form of the tawny owls, only a few went on to explain that this could lead to extinction.

Assessment Unit 3 Practical Skills

Foundation Tier (A)

This paper was generally well done. It would appear that candidates were able to successfully carry out the two investigations and get meaningful results.

Task 1

This task was answered well and the majority of candidates obtained full marks. The most common error in this task was the units being carried throughout the body of the table, and lack of knowledge regarding independent and dependent variables. Graph drawing techniques were generally good and candidates were able to use the different parts of Question 4 to scaffold their answer and ensure all points had been addressed.

Task 2

This task was answered well with most candidates being able to work out their calculations of the change in mass. The most common error at the start of this question was, once again, the units being carried throughout the body of the table. Again the graph drawing was good, and most candidates read the instructions to draw a bar chart. Some candidates did not scale the graph paper appropriately, or include units in the axis, even though they were instructed to do so, and as such lost marks. Question 5 was dependent on their own results and the majority of candidates obtained full marks.

Foundation Tier (B)

A total of 132 candidates completed this paper and a range of marks were achieved. Some candidates performed well and the standard of others was disappointing; not attempting questions or failing to carry out the key commands of the question. This was the first Foundation Tier Paper B of the new GCSE Biology Unit 3 practical papers. As such the questions were designed to test a range of abilities within the foundation tier level and across a spectrum of different practical tasks.

There was no evidence that candidates were short of space on the paper as there were very few candidates that required extra writing pages; also no evidence that candidates were short of time.

- Q1**
- (a)** Nearly all candidates were able to choose an appropriate column heading for the table.
 - (b)** Most candidates were able to correctly tally the heights of the pupils. However, a few correctly tallied the heights but did not translate this into the correct number, a careless mistake.
 - (c)** Many candidates did not achieve the mark on offer here. The most common incorrect answer was “bar chart”.
 - (d)** Again, many candidates failed to achieve the mark in this question as they did not make the link between this question and the stem where they were told there were only 20 pupils sampled.
- Q2**
- (a)** Many candidates were able to correctly state that a variegated leaf is green and white or something of a similar meaning. The most common incorrect answer was a leaf which has some parts with and without starch.
 - (b) (i)** Most candidates were able to achieve at least one mark in this question by correctly stating the plant must be kept in the dark. However, only more able candidates also gave a time scale.

- (ii) Few candidates were able to correctly ascertain that destarching the plant before the investigation proves that any starch in the plant was made during the investigation. Some candidates correctly noted the idea of a fair test. The most common incorrect answer was destarching the plant removes the starch.
- (c)
- (i) The majority of candidates correctly stated ethanol.
 - (ii) The majority of candidates correctly stated iodine.
 - (iii) Disappointingly, few candidates were able to notice that the Bunsen burner had been switched off on the account of ethanol being flammable. This question was specific to this step and therefore other safety precautions were irrelevant.
 - (iv) Some candidates were able to identify that ethanol removes the green colour from the leaf and therefore were able to achieve at least one mark in this question. However, very few were able to state the reason why the green colour needs to be removed.
 - (v) Despite some of this table already being completed for the candidates, and therefore acting as a reference point, only some candidates were able to achieve the marks available.
- Q3** All parts of this question were based on factual recall. With this in mind, the responses across the candidature were very poor.
- (a)
- (i) Very few candidates achieved 2 marks in this question. An alarmingly small number of candidates made reference to grinding/mashing/dissolving the food before adding the reagent. Some candidates were able to select the correct reagent. However, those which didn't, most commonly selected Benedict's reagent.
 - (ii) Most candidates were able to correctly state the initial colour of the reagent, fortunately incorrectly stating Benedict's as the reagent in the previous question would not hinder them getting this answer correct. However, many candidates could not correctly state the resulting colour.
- (b)
- (i) Some candidates were able to select the correct reagent, those which didn't incorrectly selected Biuret. Many candidates were able to correctly state 'boil in a waterbath'. However, many simply stated 'add to a waterbath' which is not sufficiently detailed.
 - (ii) Again, many candidates were able to correctly state the initial colour of reagent. However, only some candidates could correctly state the resulting colour.
- Q4**
- (a) Some candidates were able to achieve 2 marks in this question by correctly stating the units and measurement. However, most candidates achieved 1 mark for simply correctly measuring. This question required basic tabling skills as well as Question 1(a). Many candidates should have been able to achieve all of the marks on offer but they did not. Candidates may need more questions of this type to improve their tabling skills.
- (b) Many candidates could correctly state the first part of the trend in that, as the concentration increases, the diameter of the dark area increases. However, only a few candidates correctly identified that this levels off from 6% onwards.
- (c) Many candidates could suggest that the dark area would be smaller but were unable to suggest why.

- Q5**
- (a)** Many candidates were able to achieve 2 of the 4 marks available. Most often these were the random placing of the quadrat and the repeating marks. Most candidates neglected to mention counting the blue bells or using tape measures at right angles to make a grid. As this is a prescribed practical there really is no alternative to allowing candidates the opportunity to carry this out in the field.
 - (b)** A few candidates achieved the mark in this question. However, many missed the point of what they were asked, simply stating there are more bluebells in the shaded area. The question specifically mentions the effect of light on the growth of the bluebells.
 - (c)** Candidates were either very successful across this question or not successful at all. It appears some candidates did not know what an abiotic factor is, those who clearly did know had no problems with achieving at least 2 marks in this question.
 - (d)** Again, it appears many candidates did not know what a biotic factor was, those who did were able to name one, with a range of correct answers being given.
- Q6** Many parts of this question were practical method recall and, with this in mind, the answers given across the candidature were disappointing.
- (a)**
 - (i)** Most candidates were able to select the correct answer.
 - (ii)** Some candidates were able to achieve this mark, most commonly candidates incorrectly said they would heat it over a Bunsen burner.
 - (iii)** Very few candidates achieved these marks, with a wide range of incorrect answers being given; the most common mistake was being too vague in their answers.
 - (b)** Very few candidates achieved any of the marks on offer here and again this was due to being too vague.
 - (c)** It appears candidates could state many safety precautions which should be taken throughout this investigation. However, the question specifically referenced the incubation period and therefore many of these answers were irrelevant as they were precautions taken during the inoculation state. As such, very few candidates achieved more than 1 mark in this question.
 - (d)** Again, many candidates did not read the question properly and were either too vague with their answers or referenced precautions that are taken during the investigation rather than at the end.
- Q7** This is the first common question between the foundation and higher tier examinations.
- (a)** The candidates who attempted this question were able to achieve 2 marks. Some candidates left this question blank whilst others labelled the equipment which had already been drawn for them.
 - (b)** Many candidates achieved this mark.
 - (c)** Only some candidates were able to access both marks available; this is surprising as they were given the data and the equation and therefore the question could be deemed very straightforward. The candidates who did not access any marks, incorrectly used the temperature rise from the previous question in their calculation.
 - (d)**
 - (i)** Many candidates were able to achieve at least one mark in this question for the comparison. However, very few were able to realise that the original masses of the two biscuits were different.

- (ii) Few candidates were able to achieve all of the marks on offer in this question. Rather than focussing on validity issues with this experiment they focused on why the packet value measured by a company is better, such as they are using better equipment.
- (iii) Very few candidates were able to achieve the mark in this question. Most candidates were too vague in their answer by simply stating the chocolate has more energy.

Q8 Very few candidates were able to achieve 6 marks in this question. Most candidates scored between 0-2. Candidates focussed on the time that was stated in the question and how to make the experiment go faster, rather than how to carry out the experiment. Very few candidates were able to use appropriate scientific language and state that they would control the amount of protease rather than the volume. Candidates should avoid using ambiguous terms such as amount when referencing control variables. Those candidates that were able to achieve some of the biological indicative content also displayed good quality skills in written communication.

Higher Tier (A)

This paper was generally well done. It would appear that candidates were able to successfully carry out the two investigations and achieve meaningful results. Only in a handful of cases was there evidence to suggest that the investigation had not worked, and pupils had to be provided with a set of results produced by the teacher. In such cases teachers should only give candidates the raw data and not tables of results with headings and units.

Task 1

The table was correctly completed by the majority of candidates, though common errors included units missing from the heading, or units repeated in the body of the table.

Many candidates struggled with the scaling of the graph. Some used non-linear scales and a number were penalised for designing a scale which used less than half the grid despite the prompt provided in Part (b). Awkward scales which used 3 squares to represent 10 units often resulted in the loss of an accurate plotting mark. The points were almost always joined by short straight lines using a ruler though some were penalised for extrapolating the line beyond 60°C. Candidates who drew the axes the wrong way round were penalised two marks.

Candidates were not always able to correctly describe the effect of the independent variable on the dependent variable. Another common error was simply to list each and every point on the graph without any attempt to identify the trend.

Suggestions to improve reliability were often correct, but some candidates still confuse reliability with accuracy. Hence, while reference to repeating the experiment was the required answer, candidates who described repeating at narrower temperature intervals around the optimum were penalised (since this would improve accuracy rather than reliability).

Task 2

Although headings and units were included in this table some candidates still repeated the units in the body of the table thus losing one mark.

In Question 1(c) a number of candidates suggested improving the accuracy by measuring to 2 decimal places; this was surprising given that they had already recorded the masses to 2 decimal places. As in task 1 many candidates confused accuracy with reliability or even validity.

The bar chart was generally well drawn though some candidates lost marks for non-linear scaling, failing to use at least half the grid, or failing to label the Y axis as the **change** in mass and include units. Indeed, some misunderstood the prompt in Question 4(a) and (b) and simply labelled the X axis 'independent variable' and the Y axis 'dependent variable'. Only a minority of candidates lost a mark for leaving no spaces between the bars.

Question 5(a) was the most discriminating part of the paper; only the most able candidates realised the need to compare the number of stomata on the lower surface of B with the number on the upper surface of leaf C. Most were, however, able to identify two variables which were difficult to control though some were penalised for listing irrelevant variables such as wind or light and others for simply reiterating the dependent or independent variable.

Higher Tier (B)

Overall, this paper proved to be a challenge for the majority of candidates. They were the first cohort of candidates to experience the changes in the specification in respect of the delivery of controlled assessment. The unavailability of past papers also proved significant in the preparation for this examination. Teachers and centres will now be more aware of the requirements of this unit. It cannot be emphasised enough the importance of pupils carrying out all of the prescribed practicals as part of their preparation for this part of the examination.

- Q1 (a)** Although most candidates added both water and thermometer to the diagram, some neglected the thermometer, while others did not place it in the water. The standard of drawing was disappointing, often being freehand, with the thermometer occasionally being shown as a single line, suggesting that drawing apparatus is not commonly practiced, even though it is one of the practical skills defined in the specification (page 37).
- (b)** Few had difficulty in calculating the rise in temperature.
- (c)** Even though the word **chocolate** was emboldened in the question, a small number still substituted the data for the plain digestive into the formula. A few others had difficulty with the calculation. The vast majority however scored full marks.
- (d) (i)** When asked to explain why the energy per gram was calculated for the two types of biscuit, many wrongly suggested this made the results more reliable or accurate.
- (ii)** The vague answer, 'Lost to the surroundings', was a common response.
- (iii)** A significant proportion of answers simply restated the question by stating that the chocolate has more calories, failing to link the higher energy to the sugar and fat in chocolate. Although the focus of this paper is on practical skills, a proportion of marks in Unit 3 papers (32%) assess Assessment Objective 2, the ability of candidates to apply their knowledge and understanding.
- Q2** The quality of written communication was good in most answers. Some interpreted the question as a description of how the experiment could be done faster. Rather than describing the detail of the experimental set up, they focused on how higher temperatures, reduced egg mass or a higher concentration of protease could obtain results within 5 minutes. Of those who did describe the set up a significant number proposed either measuring the time to dissolve the egg white or using a Biuret test to monitor the result of the reaction.

- Q3 (a)** The parts of the microscope **A** and **B** were often vaguely labelled as 'lens' and 'platform' respectively.
- (b) (i)** The part X was correctly identified as the nucleus by the vast majority of candidates.
- (ii)** The ability of candidates to produce biological drawings (Practical 1.1) of these cells produced a wide range of responses but a pleasing proportion of the candidature achieved full marks.

A disappointing proportion of the candidature ignored the cells in the photograph and produced a drawing of one or two rectangular plant cells from memory. As a result, these candidates were only able to access the mark for labelling the cell wall.

Of those who did attempt to draw the cells in the photograph, their efforts were marked on four key characteristics. Firstly, the drawings needed to show an overall shape similar to the cells in the photograph. One inaccuracy shown by some was the absence of junctions in the cell walls between the two cells and their neighbours.

Secondly, since a box was provided the same size as the photograph, the drawings were expected to be a similar size and proportion to the cells in the photograph. Also, the examiners expected clear lines, not sketchy in style. Thirdly, the size and position of the nuclei in the two cells and fourthly, the use of a double line to delineate the cell wall.

A small number of candidates were not awarded the mark for labelling the cell wall because their label line did not actually contact any part of the cell wall in their drawing.

- (c)** How to prepare a slide of onion cells was for the most part well done. Two points caused difficulty. Some struggled to clearly describe that the cells used are the epidermis layer, while others were unable to recall that a coverslip was placed on top of the cells. The method of placing the coverslip at an angle and lowering it slowly onto the cells to reduce the occurrence of bubbles was however well known.
- Q4 (a)** The main issue with completing the table was the inclusion of units in the body of the table. Some were confused and recorded the data as the time taken for the student's pulse to return to normal after sprinting rather than the pulse rate at the end of the sprint. The headings in this table are another example of inconsistent use of the solidus to separate the variable and its units.
- (b) (i)** Many were able to describe the trend adequately.
- (ii)** The majority of candidates attained full marks evidencing why student **A** is fitter than student **B**. A few however gave the wrong data, or did not actually explain why the data showed that **A** was fitter.
- (c) (i)** A significant number of candidates struggled to give two changes. They either gave vague answers such as 'Increases' or gave two from the same mark point e.g. 'increased breathing rate' and 'shorter breaths'.
- (ii)** The significance of the emboldened '**one other**' was not always recognised by candidates. Since the previous parts of the question related to changes in pulse rate, and breathing rate, this question was asking for other effects. On reflection, a clearer definition of what examiners meant by 'short term' would probably have assisted candidates, but the mark scheme was expanded to accept a wide range of responses.

- Q5 (a) (i)** Most candidates were familiar with interpreting this type of graph and correctly identified the point where the percentage change in the mass of the potato cylinder was '0'. Nevertheless, a disappointing number were not able to accurately read the concentration value from the graph. Others also have difficulty articulating the relationship between the concentrations of the solution and the potato cells.
- (ii)** Many candidates were successful in their description of the cells losing mass and explaining that as due to osmosis. They had much greater difficulty however explaining unambiguously the differences in concentration that caused osmosis. Candidates need to state either that water moves from a dilute to a (more) concentrated solution, or from a solution with a high concentration of water to a solution with a low(er) concentration of water.
- (b) (i)** A substantial proportion of the candidates did not recall the term lysis.
- (ii)** Surprisingly poorly answered. Presumably, following on from questions about osmosis, many candidates thought the different response was due to blood plasma and sugars within red blood cells. Of those who did recognise the difference was due to the presence of the cell wall, a significant number did not explain what its role was.
- Q6 (a)** The main error was to state that 'fungus kills bacteria' with no further clarification. There was also confusion between penicillin and *Penicillium* with many thinking penicillin is the fungus. Few candidates understood that the chemical produced by the fungus has to diffuse through the agar.
- (b)** Disappointingly answered with a proportion leaving the names blank while others made up comical names.
- Q7 (a) (i)** Many candidates misunderstood the point of setting up the potometer under water, suggesting it allowed bubbles to be seen or counted.
- (ii)** Although a high proportion of candidates achieved this mark, many answers contained contradictions by referring to the sealed joints either stopping air getting **in or out**, or stopping water getting **out or in**.
- (b) (i)** Many answers suggest that candidates misunderstand the relationship between heat and humidity. Using a fan to create windy conditions was well known.
- (ii)** Humidity was again the main issue. 'Normal humidity' was a commonly vague response while there was also further evidence of confusion about how temperature could control humidity.
- (iii)** While many attained full marks, some only referenced the distance the bubble moved and the time taken. Others, presumably picking up on the emboldened '**average**' in the question, limited their answer to replicating the experiment. A few continued the confusion mentioned above by referring to counting bubbles.
- (c)** A good number of candidates explained the way wind moved water (moisture) away from the leaves or stomata. They did not always adequately explain how that increases the diffusion gradient within the leaf. Few linked this to increased evaporation.
- (d) (ii)** Although most answered correctly, many misunderstood the investigation described and answered, 'wind speed' or 'rate of transpiration'.
- (e)** A good proportion of the candidature attained both marks. Common misunderstandings were 'respiration' and 'evaporation'.

Contact details

The following information provides contact details for key staff members:

- **Specification Support Officer: Paul Grogan**
(telephone: (028) 9026 1200, extension: 2292, email: pgrogan@ccea.org.uk)
- **Officer with Subject Responsibility: Gareth Wilson**
(telephone: (028) 9026 1200, extension: 2267, email: gwilson@ccea.org.uk)



INVESTORS
IN PEOPLE

