Rewarding Learning

GCE AS A2 Biology Revised
Spring 2010

Chief Examiner's Report

GCE BIOLOGY (REVISED)

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Grade Boundaries

Grade	Uniform Mark
Maximum Mark is 300	
A	240
B	210
C	180
D	150
E	120

ASSESSMENT UNIT AS 1 MOLECULES AND CELLS

This was a straightforward paper with candidates of all abilities being able to respond to all of the questions. There was a wide range of marks, both across the whole paper and within each question, which showed it allowed good discrimination between candidates. However, in comparison with other recent papers, there were fewer candidates scoring close to full marks. There was no evidence of candidates having insufficient time to complete the paper.

There is still a significant number of candidates who lose valuable marks by giving vague answers (for example in Q1(b), Q3(b), Q5(d) and Q8) or by not reading questions carefully enough (for example in Q7(b)). Calculations still pose a problem for some candidates and the skills question (Q4) proved difficult for a large number of candidates. Use of biological terminology has improved – this was particularly evident in Q2 on water potential.

SECTION A

Q1 This question, on the use of reagents to test for carbohydrates and proteins, proved to be discriminating. Although it was well answered by many candidates there was a significant number who showed some knowledge of the reagents but did not know how to use them.

Q2 This question tested the candidates' understanding of the concept of water potential. The majority of candidates showed that they do now understand the terminology and it was encouraging to see very few references to 'water concentration'. However there are some candidates who still struggle with the direction in which water actually moves (less negative to more negative).

Q3 In this question on DNA fingerprinting most identified the enzyme correctly but accounting for the reason behind the different fragment lengths was poorly answered and prompted descriptions of gel electrophoresis in many cases. While most candidates identified 'Suspect B' correctly, many gave vague answers in their attempt to explain why (for example – references to 'identical DNA').

Q4 This skills-based question showed great discrimination between candidates. Drawing skills have improved greatly in recent years and many candidates achieved high marks for their block diagrams. However a significant number of candidates did not know what was required. Labeling the diagram also proved challenging for many and even the most able candidates had problems in identifying where the 'mucosa' actually is.

Q5 This question about the enzyme inhibitors was generally well answered, although it still proved discriminating at the higher end. Parts (a) and (b) were well answered by many. While part (c) was generally well answered it also showed the recurring difficulty some candidates experience with the terms "describe" and "explain" and many candidates failed to identify both parts of the trend. In part (d) poor use of language led to many candidates failing to score highly.

Q6 This question, requiring candidates to recognise features within a eukaryotic cell and in a virus, proved to be very discriminating. Part (a) was generally well answered, although a number of candidates gave vague answers regarding 'membrane-bound organelles', which then subsumed their second answer (e.g. nucleus). While part (b)(i) was well known (b)(ii) proved difficult for the majority and only the most able candidates scored well part (c)(ii).

Q7 This was the most challenging question for the majority of candidates, mainly because the majority of candidates failed to read parts of it carefully enough. The introduction explained what had been placed on the chromatogram but this appeared to have been ignored in answering part (a) so that only about 50% got the correct answer in (i) (the rest suggested 5 or 6 amino acids). Likewise many struggled to correctly identify 'methionine' in part (ii). While the calculation was well done by the majority some candidates ignored the distances given and measured their own. In part (b) the vast majority did not read the question and so described how to set up and run a chromatogram instead of describing how to develop the spots. However a reasonable number of candidates did eventually gain some marks at the end of their answer. Part (c) was answered well by many although some tried to explain part (iii) in terms of pH or temperature. Part (d) proved very challenging for all but the most able candidates. Many could not describe the structure of starch and cellulose and those who could identify differences in structure found it hard to explain why this would make it more difficult for cellulose than for amylase.

SECTION B

Q8 Again there was a problem for many candidates in reading part (a) of this question, so that many included unnecessary information about non-chromosomal activity (for example about replication of other organelles and cytokinesis). There was also some confusion between the terms 'chromatids' and 'chromosomes'. Nevertheless many candidates scored highly in this part of the essay. Part (b) was a little more challenging and poor use of language lost marks for a significant number of candidates (for example vague references to 'variation' instead of 'genetic variation' and general use of terminology like 'chiasmata' without explanation of where specifically they occur). However many candidates showed good understanding of the role of crossing-over and of independent assortment in generating genetic variation.

Quality of written communication was generally good.

ASSESSMENT UNIT AS 2 ORGANISMS AND BIODIVERSITY

This was a very discriminating paper, which allowed candidates of all abilities to demonstrate their knowledge of the topics examined. Several questions (Q4 and Q6) involved the interpretation of diagrams while questions three, six, seven and eight required the analysis of experimental data. In question five, the candidates were required to select and draw the most appropriate graph to illustrate the results of an ecological survey while in questions six, seven and eight candidates had to analyse and extract information from provided graphs. In question nine, candidates were required to select and sequence their ideas on the process of transpiration and the environmental factors which affect it.

SECTION A

Q1 This question on molecules found in a variety of cell walls proved to be surprisingly discriminating. The most commonly misunderstood molecule was suberin as the waterproofing agent in the root endodermis.

Q2 This was a discriminating question which examined candidate knowledge of taxonomy. In parts (a) and (b), a large number of candidates were unable to extract the relevant class and species names from the taxonomic hierarchy provided. In part (c), a sizeable minority were unable to define the term 'species'.

Q3 This question on gas analysis using the J-tube apparatus proved problematical for a large number of candidates. In part (a), only a small proportion of the candidature knew that operating the J-tube under water would prevent fluctuations in temperature, with many suggesting that it prevented escape of the air bubble.

It was obvious in part (b)(i) that few candidates had hands on experience of the apparatus and had little idea of what to do with measurements provided. In part (b)(ii), a large proportion of the candidates ignored or did not understand the term 'source' in the question stem.

Q4 A discriminating question which examined candidate knowledge of the gas exchange system. This question highlighted the age old problem of candidates not reading the question stem properly. In part (a), a large number of candidates simply rhymed off learnt characteristics of the gas exchange system rather than describing characteristics evident in the diagram as requested. One common example of this was the term 'moist' when there was clearly no moisture layer shown. In part (b), the most common problem was vague answers in relation to the alveolar macrophage cells.

Q5 This question examined candidate knowledge of biodiversity, strategies for improving biodiversity and ecological sampling methods which could be used to measure biodiversity. Candidates then had to graphically represent the data provided and analyse the results obtained. The most discriminating question part was part (b), where candidates were asked to explain why a transect was used and why percentage cover would have been used to measure the abundance of the plants sampled. Only a small minority of candidates were able to answer these questions - possibly due to a lack of hands-on experience.

Q6 This was a discriminating question which related diagrams of the heart at different stages in the cardiac cycle to the cardiac cycle graph itself. In part (a), some candidates did not identify the stage represented in the diagram but rather described what was evident in the diagram. Part (b) was generally well attempted with most candidates opting for diagram A and being able to select an appropriate piece of evidence from the information provided. In part (c), the main discriminator was part (iii) where the vast majority of candidates ignored the term 'structure' and failed to tailor their answer to the question. Surprisingly, in part (d) candidates who were able to explain the rises in atrial pressure at both points got them the wrong way round.

Q7 This question involved analysis of data on the peppered moth (*Biston betularia*) in relation to atmospheric pollution over a thirty year period. The candidates are to be commended on how they were able to extract the appropriate evidence from the graph and marry it to their knowledge of this subject. Part (c) was the most discriminating part of this question with only the better prepared candidates being able to explain how the changes in the moth population could be considered as an example of directional selection.

Q8 In this question, candidates had to apply their knowledge to oxygen dissociation curves for myoglobin and haemoglobin at two different partial pressures of carbon dioxide. In part (a)(i), many candidates defined haemoglobin rather than the general term 'conjugated protein' as requested. The term 'partial pressure' was not generally well understood with many answers relating to concentration levels. In part (b)(i), most understood the role of myoglobin, although quite a few candidates seemed to think that myoglobin played a role in oxygen transport. Part (b)(ii) was quite well answered with the majority of candidates knowing when and how myoglobin would come into action. Part (c)(i) was reasonably well answered although the explanation of curve choice was beyond all but the best-prepared candidates. Strangely in (c)(ii), some candidates insisted on converting their value extracted from the graph to a percentage value.

SECTION B

Q9 This was a very discriminating question on transpiration and three environmental factors that influence its rate. In part (a), few candidates gained full marks with many answers lacking detail such as evaporation of water from the mesophyll surfaces and its concomitant diffusion through the stomata. In part (b) most candidates were able to describe the effect of temperature, humidity and wind speed on transpiration rate but only the better-prepared could adequately explain it. In some cases it was noted that the term 'humidity' was not understood and in several answers candidates suggested that in high humidity, plants could take up more water through their leaves.

ASSESSMENT UNIT A2 1 PHYSIOLOGY AND ECOSYSTEMS

Grade Boundaries

Grade	Uniform Mark
A	96
B	84
C	72
D	60
E	48

This was the first of the new specification A2 papers and a large candidature undertook it. At 2 hours in length and 90 marks being allocated, the paper was quite demanding. Generally, responses were of a good standard though marks above 75 were very few in number. Similarly, few marks were below 40, so many candidates were 'bunched' in the middle. All questions were discriminating and the paper gave all abilities the opportunity to show what they knew, understood and could do. Overall, responses to the paper indicated that the main way in which candidates might improve is to provide 'precise, detailed biological answers': too often here, answers were vague and lacked the detail required at this level. Also, there is evidence that candidates tend to struggle when required to apply their understanding to novel situations. This was most obviously the case in Q8 (the kidney), which was certainly the most difficult for candidates. In such situations they need to read the information supplied very carefully and think before responding.

SECTION A

Q1 Candidates were required to comment on features relating to the structure of a neurone. Part (a), on the structure of a neurone, was well answered and, in part (b), the direction of an impulse was well known. However, part (c) was more discriminating, and many candidates confused impulse with action potential. The myelin sheath does not prevent the passage of an impulse – there would be no impulse at all then! – but it does ensure that action potentials only occur at the nodes of Ranvier and so 'jump from node to node'.

Q2 This question tested understanding of natural passive immunity. Part (a) was particularly well done and caused few problems for candidates. However, this was not the case for parts (b) and (c). The fall in the level of antibody (part (b)) is due to its degradation and the fact that the infant was no longer receiving it. The reason for the failure of early vaccination (part (c)) is due to the antibodies already present combining with introduced antigen (in the vaccine) so that lymphocytes could not be sensitised. Answers were too frequently badly worded with many suggesting that the antibody 'died' or 'killed' the vaccine. Also there were too many erroneous references to 'memory' cells: memory cells are only produced following the introduction of an antigen and only become active with a further, later introduction of the antigen. This was simply not the case here. There is a suspicion that candidates make indiscriminate use of past questions and especially past mark schemes. Answers must be appropriate to the question asked; and candidates must read the question carefully.

Q3 An analysis of experimental results, on the influence of light on the movement of auxin and its effect on the growth of coleoptiles, was assessed in this question. While discriminating, responses were generally of a high standard. Part (a) was well done, though some considered that there would be curvature of the coleoptile, even though agar blocks were positioned centrally. Part (b) was more difficult though candidates showed that they had a good understanding of the principles involved and were able to apply that understanding to what would have been a novel situation. Understanding of the need for a 'control' experiment was also well understood.

Q4 This question on the different muscle types was rather 'hit or miss' for many candidates: those who were familiar with the photographs and the different muscle tissues (part (a)) did very well; those whose knowledge was more limited performed poorly. Part (b) on the protein filaments in muscle fibres was very well done: most candidates were familiar with actin and myosin. Part (c) also demonstrated good understanding of the arrangement of actin and myosin in a myofibril though there were some who could only manage the vaguest of answers.

Q5 This question related to the productivity of a beef farm. Part (a), on the calculation of percentage efficiency of energy transfer from incident light to grass productivity, was often well done. In part (b), the lower efficiency of energy transfer to primary consumers than to secondary consumers needed to be explained: basically grass with an abundance of cellulose is much more difficult to digest and so more of the consumed energy is egested and goes to the decomposers. In part (c), candidates were required to explain ways in which the productivity of grass (i) and of beef (ii) might be increased. The latter was generally well done the former was not: simply saying that fertilisers increase growth was not sufficient, candidates had also to show understanding of the role of at least one of the ions present. Overall, answers to parts (b) and (c) were too vague and failed to indicate solid biological understanding.

Q6 This question required an understanding of the carbon cycle, the enhanced greenhouse effect and of the cause and effect of acid rain. Part (a) was well answered and very few candidates had any problem in recognising the processes of the carbon cycle. In part (b), the majority of candidates showed at least a basic understanding of the enhanced greenhouse effect. However, many provided superficial answers lacking the extra detail required at A level, while others confused the greenhouse effect with ozone depletion (perhaps being confused by the fact that some gases, but not carbon dioxide, cause both). In part (c), some candidates failed to name a gas causing acid rain while many, again, provided answers lacking sufficient detail, e.g. that released aluminium blocked gills causing the asphyxiation of fish.

Q7 This question tested the candidates' understanding of 'pest control'. In part (a) too many candidates described a 'monoculture' rather than explaining why it is susceptible to pest infestations. Part (b) was frequently well done, especially (i), though in (ii) too many considered it sufficient to explain that 'a biodegradable insecticide is safer for the environment' because it did less harm to organisms. Part (c), the predator-prey curve, was generally very well done. Part (d) was more discriminating with a surprising number unfamiliar with the term 'biological control' and with many showing insufficient understanding of the topic. Part (e), on the mark/recapture technique, was very well done.

Q8 This question relating to kidney function was the most difficult on the paper. This was not surprising since it is a difficult topic and data interpretation is always testing. In part (a) candidates had to explain differences in the levels in glucose and protein in the early part of a nephron. Too often answers were imprecise and failed to reference the size of the molecules and the effect on filtration, with the basement membrane as the filter, or did not describe the precise mechanism of reabsorption (small proteins by pinocytosis, glucose by active transport). In part (b), few candidates failed to recognise that as water is reabsorbed in the proximal tubule then, since sodium levels did not rise, sodium must be reabsorbed; nor were they able to discuss the possible reasons for the change in sodium levels in the distal convolution. However, most candidates had a good understanding of the increase in sodium ions at the base of the loop of Henlé (indeed, many giving more detail than is required within the specification). Changes in urea levels (part (c)) were also not fully explained, though most did recognise the importance of water reabsorption in increasing urea concentration. Part (d) asked candidates to suggest reasons for the fall in flow rate 'as fluid moves from the plasma into and then along the nephron'. Too often answers referred to the pressure of the blood within the glomerulus rather than addressing the question as asked. While part (c) was often well answered, it was surprising how many found it difficult: some candidates simply made vague references to energy or kinetic energy.

SECTION B

Q9 This prose account on the functioning of the mammalian eye produced a wide range of marks among the candidature. Overall, responses were very reasonable. The main weaknesses arose from the use of inaccurate terminology and an imprecise understanding of processes. To give one example in each of the sections:

- it is not sufficient to say that a dilated **pupil** lets more light in, the answer should explain the advantage accruing from this;
- in the functioning of the lens the suspensory ligament does **not** contract or relax, though it may be taut or slack according to pressure in the wall of the eyeball and the action of the ciliary muscles;
- explaining the additive effect resulting from retinal convergence of rods is always difficult – it is not a summation of stimuli or impulses; and
- in the functioning of cones, colour vision continues to be poorly explained. The quality of written communication was often good, but there were too many rambling accounts and too many who failed to incorporate sound biological terminology.