Rewarding Learning

GCE AS Biology (New Specification)
Spring 2009

Chief Examiner's Report

GCE AS BIOLOGY (NEW SPECIFICATION) (SPRING SERIES) 2009

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Assessment Unit AS 1: Molecules and Cells

This first paper of the new specification provided a fairly comprehensive testing of the unit content. The paper generated a wide range of marks in the candidature and was therefore discriminating. Many candidates scored well and must be congratulated on their preparation for, and performance in, this examination.

The following general comments are made to offer guidance as to how performance might be further improved.

- Reading carefully the information given in questions.

  Examiners spend considerable time planning questions so that candidates are provided with the information that they need. Some candidates, for whatever reason, are too careless in their reading of questions; candidates should take time to read through the information given to them and use all that provided in constructing their answers. Examples of this are provided with respect to Q.5, part (c) *(not differences involved regarding membrane-bound features)* and part (a) of Q.7 *(differences between nucleotides, not nucleic acids)*. Also, candidates seemed to miss the guidance in Q.5, part (b)(iii) in which they were asked to use their 'understanding of the events in the cell cycle'.

- Glossary of terms used in written examinations.

  Some candidates continue to confuse instructional terms used in questions, most obviously 'describe' and 'explain' (eg Q.6, part (c)). Their attention should be drawn to appendix 1 of the subject specification and to the recent Student Guide (command terms used in written examinations – an extension).

- Biological terminology and definitions.

  Biological terms and definitions are sometimes not well understood or well described. It is important that candidates have a thorough comprehension of the terms that are used at this level and of the relationship between them (for example, 'solute potential' and 'water potential' in AS 1 Q.4). (A useful exercise might be to ask candidates to prepare a glossary of terms used in each topic on its completion).

- Sequencing the events of a relatively involved process.

  Some candidates find difficulty when required to describe relatively involved processes such as the incorporation of hydrolytic enzymes into lysosomes (Q.1). Candidates may find it helpful to develop their understanding by breaking the process down into a sequence of events, for example, within a flow diagram (or series of bullet points or similar).

- Analysis and interpretation of graphical data.

  There are a number of issues here. When asked to describe the trends, candidates must make a conclusion about the pattern illustrated in the graph and not simply describe the graph point by point. This problem was exemplified in Q.5. Further, candidates when asked to explain the trends must go beyond describing them, but must apply their understanding to present reasons for the changes illustrated.

- Calculations (numeracy).

  All papers, at both AS and A2, will continue to have question parts in which the candidate is required to make a calculation. Some calculations involve a well-defined formula, while other calculations may be more general involving the determination of, for example, percentage changes (Q.4) and ratios. All candidates should have practised a suitable range of calculations as part of their biology course and as preparation for their examinations. It is also assumed that all candidates bring with them to the examination room a ruler and a calculator.

- Communication (quality of written communication).

  The quality of candidates' written work is generally good. It would appear that candidates now practise, on a regular basis, prose questions as part of their course. Still, there is no room for complacency and one area for improvement would be sentence construction: occasionally answers are presented in note form; while, too often, full stops are missing, and sentences are joined by commas.

- Legibility and clarity of candidates' answers.

  For examiners to fully credit all answers, candidates should ensure that their work is as legible as possible. Further, candidates should not use pencil to complete their answers simply because it is too faint and difficult for examiners to read. Neither should candidates use the examiners' column. Further, a few continue to answer using text-message abbreviations which are not acceptable and will not be understood by examiners.

Section A

Q.1 Candidates were required to exhibit an understanding of the sequence of events in the production and packaging of lytic enzymes into lysosomes. This was quite a difficult opening question in that it required candidates to construct their answer and decide what detail to provide. Nevertheless, the mark scheme was also reasonably open with the result that while the maximum mark of three was the most common score, the question managed to differentiate well.

Q.2 This question used insulin structure to exemplify the levels of protein structure.

(a) The primary structure in part (a), was well known by most.

(b) Part (b) was devised to test candidates' ability to apply their understanding of tertiary and quaternary structure to the information provided diagrammatically

about the role of cysteine in forming disulphide bridges. This was testing and yet the more able candidates performed very well.

(c) Part (c), about the variable nature of the R-radical, eg in containing sulphur in the amino acid cysteine, was less well known.

Q.3 Nuclear division was tested in this question.

(a) In part (a) a photograph of stages of mitosis was provided. This was extremely well done, which was particularly pleasing since interpretation from photographs has often been found to be especially testing.

(b) Part (b) showed a diagram of chiasmata within an homologous pair of chromosomes during prophase I of meiosis. This part was more discriminating. The best answers clearly distinguished between the event of crossing over and the genetic consequence in providing new allelic combinations.

Q.4 (a) & (b) This question tested the candidates' understanding of the concept of water potential and the water relations in plant tissue. Some candidates have a clear understanding of the concept and therefore do very well in this type of question. Others, unfortunately, have a more muddled understanding and have difficulty working in the negative realm or confuse the determination of solute potential with the determination of water potential. Candidates should know that tissue which increased in length had water entering because the external solution had a higher (= less negative) water potential – part (a) – and that the tissue and external solution water potentials are equal when there is no net loss or gain in length – part (b). Candidates are advised to practise a range of different calculations.

(c) In part (c), candidates had to determine that an 8% loss in length would reduce a 50 mm length of tissue to 46 mm. This was frequently not well done. In part (d) the recognition and drawing of a plasmolysed cell was generally good.

Q.5 (a) The general theme of this question was mitochondria. In part (a), their structure and function was most frequently well done.

(b) Part (b) showed data of how cell size correlated with mitochondrial density in cells of an actively dividing culture. The graph in sub-part (i) was a scattergram. While this was often well done, many showed a degree of inexperience in drawing graphs. Candidates are advised to review the mark scheme to learn those points which are regarded as important. In sub-part (ii) many missed the trend that very large cells (eg over 900 μm) tend to have a maximum of around 150 mitochondria. Sub-part (iii) was designed to be testing. It used the command term 'suggest' and so it turned out. The key to the question was to use the information in the stem to use 'your understanding of the events in the cell cycle': mitochondria divide during G_1 while the cell as a whole increases in size during the growth phases (G_1 and G_2) of interphase.

(c) In part (c), candidates have a singular lesson to learn – *read the question carefully*. Too many provided differences between prokaryotic and eukaryotic

cells on the basis of membrane-bound bodies when they were explicitly asked not to do so in the question stem.

Q.6 This question required an understanding of carbohydrates and starch digestion.

(a) Part (a) required a straightforward comparison of starch and maltose. Too many provided answers which were unable to show progression beyond GCSE – for example in sub-part (i) many answered 'glucose' rather than 'alpha-glucose', while in sub-part (ii) there were those who considered that peptide links were involved in one of the structures.

(b) Part (b) allowed candidates the opportunity to demonstrate their practical knowledge. In sub-part (i) most candidates managed to score at least two marks by recognising the need for the iodine test for starch and knew the appropriate colour change to blue-black, even though there were some who thought that either Benedict's or Biuret test would have been appropriate. The better candidates understood the need for taking samples at regular intervals and/or the advantage of using a colorimeter for determining the intensity of the test colour and so the amount of starch left in solution. Sub-part (ii), as expected, asking for a limitation in the procedure was particularly discriminating.

(c) Part (c) required candidates to describe and explain results which should not have been overly unfamiliar to them; the course of amylase digestion of starch. Only the better candidates observed the exponential decline nature of the data and were able to explain that this was due to the decreased amount of substrate (as it is progressively digested) and so the reduced number of enzyme-substrate collisions.

Q.7 Nucleotides and DNA was the topic in this question. Again candidates' attention is drawn to the need to *read questions carefully*.

(a) In part (a), many compared RNA with DNA rather than their nucleotides. Single or double stranded was not an option. The examiners' suspect that many, having practised past questions and used past mark schemes, fail to apply their understanding to the question asked.

(b) Part (b) was on a new topic to the first module – PCR. In sub-part (i) many showed a very good understanding of the procedures involved. Sub-part (ii) proved more testing, however.

(c) Part (c) tested candidates' understanding of the action of restriction endonucleases. Most understood specificity for a particular base sequence though some failed to add further detail.

(d) Part (d) was a problem-solving question testing understanding of base pairing. It was a discriminating part, though many succeeded.

Section B

Q.8 The first part of this free-prose question, on membrane structure, was relatively straightforward and was well answered. The second part, which required candidates to relate membrane structure to the movement of different molecules through the membrane, was more testing. As a whole, the question allowed scope for the best candidates to demonstrate the extent of their knowledge, while weaker candidates were able to score, though obviously not as well. The quality of written communication was also generally good, with well-sequenced accounts that incorporated sound biological terminology.