GCE AS EXAMINERS' REPORTS

BIOLOGY
AS

SUMMER 2019

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BIOLOGY COMPONENT 1

GCE AS

Summer 2019

BASIC BIOCHEMISTRY AND CELL ORGANISATION

General Comments

The paper was well accessed with nearly all candidates attempting all questions. Factual recall and inclusion of key terminology was evident in those candidates that performed well across the paper. There were no particularly obvious trends in preference of topic within the unit although the extended response question proved most challenging for many candidates. Regarding the extended response, it was pleasing that candidates demonstrated that they were able to deduce the elements that required discussion, but the requirement to compare three components proved challenging. Overall performance was in line with that of the previous year and this mirrored the perceived accessibility of challenge of the questions.

Comments on individual questions/sections

Q.1 **(a)** This question was answered well by a significant proportion of the cohort. Many candidates were able to answer why ATP is considered to be a universal energy currency, with stronger candidates understanding that the energy was released from high energy bonds. Some candidates included information about the advantages of ATP as an energy source, which was not required for this question. Some candidates were less clear of the classification of the nitrogenous bases and the names of the bases within them.

(b) A significant number of candidates were not aware that chloroplasts also synthesise ATP and that its synthesis is an endergonic process. Many correctly performed the calculation which required candidates to recall that an approximate yield of 30.6kJmol^{-1} is released upon hydrolysis of the first and second phosphate group.

Q.2 **(a)** This section was well answered with only a minority of candidates not recalling the name of the R-group in an amino acid. Mathematical calculations of volume were well executed and candidates were able to connect the distribution of lipid within cells to their role in thermal insulation. Fewer candidates were able to make the connection that respiration releases heat.

Q.3 **(a)** Biochemical recall was strong amongst many candidates.

(b) Although, in the majority of scripts this question was well answered, there remains some misunderstanding between the terms ‘complementary’ and ‘similar’ when describing enzyme kinetics. Key to securing marks for b(i) was clearly demonstrating knowledge of the importance of the active site and the prevention of successful collisions. Accurate use of scientific terms and fully descriptive answers were essential to gain credit.

When drawing graphical data, candidates are advised to use crosses for data points and ensure that any line drawn enters and leaves the centre of each point.

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Many candidates were correctly able to explain how the results showed that galactose acted as a competitive inhibitor. However, many candidates, incorrectly interpreted the question and failed to give the correct biological reasoning.
An understanding of immobilised enzymes was communicated well by many candidates. Again, accurate terminology was important to gain credit and a significant number of candidates failed to recognise that stability was provided at higher temperatures. Many answers were too vague to gain credit and candidates are reminded that the focus of many enzyme questions will require them to include the function of the active site in their answers.

Q.4 **(a)** A minority of candidates were not able to identify the locations of the three types of RNA.

(b) This question was answered well by the majority of candidates.

(c) Whilst candidates often secured the mark relating to multiple polypeptide chains, fewer candidates recognised that not all proteins are enzymes.

(d) Many candidates were able to give a detailed description of transcription. However, an alarming number of candidates thought that the non-coding strand was used as a template and that DNA polymerase was used to form phosphodiester bonds between the adjoining free RNA nucleotides.

(e) The identification of the coding and non-coding regions was well executed, although some non-phonetic spelling errors negated this marked. A significant number of candidates were able to secure full marks for this section. However, weaker answers failed to recognise that introns are removed from the mature mRNA strand, or that it is the different combination of the exons which resulted in the different polypeptide chains, and their subsequent differences.

Q.5 A well answered question, although some candidates were not clear on the kingdoms that are present in the domain.

Q.6 **(a)** Well executed answers included justification of their choice. The stem of the question stated that an explanation was required.

(b) Good answers linked zero pressure potential being identifiable with the cell membrane pulling away from the cell wall and most candidates were able to identify a sensible negative number for water potential from the data table. Less precise answers supplied positive values and no units, although on this occasion candidates were not penalised for the absence of these.

For part (iii), many candidates misinterpreted the question which required them to estimate a more accurate water potential using the data in the table and instead gave an improvement to the procedure. This was required for a later question.

Many candidates are not able to identify how to improve reliability and accuracy of a procedure or were too vague in their responses, failing to identify, for example, an appropriate range in which to reduce the intervals of concentration.

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Interpretation of the images was comprehensibly understood with nearly all candidates securing full marks.

Q.7 The extended response question required candidates to explore their knowledge of organelles and compare the organelles to prokaryotes, before using their knowledge of membrane transport and cellular/metabolic processes to suggest evidence for the theory of endosymbiosis. Simple comparisons of the types of structures present was common and detailed, but few candidates included the relevance to these features or their functional roles. This meant that only a minority of candidates were able to identify similarities in auto-trophism/photosynthetic ability (chlorophyll presence in photosynthetic bacteria and chloroplasts) or respiratory capacity of the mitochondria and (the contested theory of) the role of mesosomes. Candidates had drawn from the text and correctly surmised that the organelles are thought to have been engulfed by prokaryotes with many further identifying the mechanism to be phago- or endocytosis. Descriptions of the mechanics involving vesicles and subsequent formation of the double membrane was less common. Some candidates assumed involvement of the prokaryote cell wall in the formation of the double membrane. There was little reflection on the evolutionary process i.e. that initially this occurred and was temporary, but that overtime, became a permanent feature. Endosymbiotic advantages were discussed well by many. Recognition of the mutualistic relationship was communicated well with many candidates connecting energy provision, nutrient supply, protection and compartmentalisation to explain symbiosis.

Summary of key points

- Candidates must be more accurate when plotting data. Crosses are preferred over dots and lines should be drawn with a ruler and enter and leave the centre of each data point.
- Factual recall, and therefore knowledge of AO1, was weak across the unit, but in particular within biochemistry.
- Spelling of key biological terms needs greater focus to avoid needless loss of marks e.g.: mitosis not meitosis, exon not extron.
- Improved attention to examiners instructions in displaying mathematical answers to the correct degree of accuracy is needed.

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BIOLOGY COMPONENT 2

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BIODIVERSITY AND PHYSIOLOGY OF BODY SYSTEMS

General Comments

The paper was well accessed with nearly all candidates attempting all questions. Factual recall and inclusion of key terminology was evident in those candidates that performed well across the paper. There were no particularly obvious trends in preference of topic within the unit . Overall performance was in line with that of the previous year and this mirrored the perceived accessibility of challenge of the questions.

Comments on individual questions/sections

Q.1 This question required candidates to demonstrate a knowledge and understanding of the mammalian circulatory system.

(a) Candidates had little difficulty in correctly calculating the mean pressure in the lung capillary from the data provided. Although most candidates could explain the cause for the difference in pressure for part (ii), they generally struggled to explain adequately and consequently few gained this mark. Candidates gained the first mark in part (iii) but few were able to adequately explain the advantage for the second mark.

(b) Virtually all candidates were able to draw an arrow correctly showing the direction of movement of blood in the capillary but many struggled to account for the difference in maximum and minimum pressures although stronger candidates were able to gain full marks for this section.

(c) It was surprising how many candidates were unable to correctly identify the chordae tendineae from the photograph. Since dissection of the heart is a specified practical in the specification candidates should be familiar with the appearance of the structures shown. Consequent to this, many failed to gain the two marks for explaining the function in part (ii) as they had incorrectly identified the structure in part (i)

(d) Candidates were generally able to state an ethical issue for this part although some inappropriate responses were also given which failed to gain this mark.

Q.2 This question required candidates to apply their knowledge and understanding of modes of nutrition and species identification using DNA sequencing.

(a) This part was generally well answered with candidates able to give the definition of a saprotroph although some responses were too vague to gain credit.

(b) The majority of candidates were able to correctly name one essential inorganic ion and explain why it is needed by plants.

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(c) In this section candidates gave sensible explanations of the position of the algae within the fungal thallus but then struggled to account for the distribution. Very few candidates appreciated that the fungus retained moisture which prevents the algae from drying out.

(d) Many good responses were seen to this section and a fair proportion of candidates gained both marks.

(e) This part was well answered in general with many gaining both marks.

Q.3 This question required candidates to apply their knowledge and understanding of haemoglobin as a respiratory pigment and the Bohr effect.

(a) The calculation of the slope of line Y in part (i) was correctly carried out by most candidates. Explanation of the sigmoid curve proved to be more of a challenge and many candidates failed to gain any marks here despite versions of this question having appeared on several past papers.

(b) This section was generally well answered and candidates who were well prepared were able to gain the majority of marks on offer. Several good candidates gained full marks for this section.

Q.4 This question required candidates to demonstrate a knowledge and understanding of ecological sampling methods and the use of Simpson's diversity index to calculate a value for biodiversity.

(a) Candidates had little difficulty defining biodiversity although a few failed to refer to both species richness and evenness in their definition. Many very good descriptions of methods for sampling biodiversity were seen and full marks were gained by the better candidates here. Candidates were generally able to explain the importance of taking large numbers of random samples but when it came to suggesti a suitable control they had more difficulty, with many candidates seeming to be confused about the purpose of the investigation.

(b) This section was very well answered, and candidates frequently gained all the available marks. Some however did not give the answer to 2 decimal places as instructed and were therefore limited to 2 marks. Conclusions were clearly set out and linked to the diversity index calculated.

(c) Candidates who made appropriate use of the data available gained good marks for this section but those who ignored the instruction to use data often struggled to give clear answers and gained fewer marks.

Q.5 This question required candidates to demonstrate a knowledge and understanding of gas exchange in insects, earthworm and fish.

(a) Labelling of the diagram was very well done by the majority of candidates.

(b) Candidates demonstrated a good understanding of the need for a circulatory system and respiratory pigment in earthworms, but fewer were aware of the limitations on size imposed by the insect's tracheal system.

(c) This section was generally well answered and candidates were clearly well practiced in this type of calculation.

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(d) Both parts of this section were well answered with many good responses gaining full marks.

(e) Stronger candidates were well able to apply their understanding of counter-current flow in the gills to the tuna's heat exchanger and some very good responses were seen. Weaker candidates tended to refer to gas exchange in their answers, and these were not credited.

(f) Good responses to this question were rarely seen. It should be emphasised that candidates need to make use of the information in the stem of the question in their answers. In this case very few candidates were able to link the tuna's ability to make deep dives in cold water with the need to preserve heat in the blood and muscle.

Q.6 This question assessed the quality of extended response (QER). The best answers fully addressed the adaptations to the different environmental conditions visible in the photomicrographs shown. It was encouraging that most candidates made a fair attempt at this question. Weaker responses showed poor preparation with lack of detail and were often written as a list of features with no attempt to link the adaptation to the ability of the plants to survive in different environments. Again it should be emphasised that candidates need to use the information given in the stem of the question in their responses. Having said that, it was very encouraging to see that many candidates were able to access the upper band of marks and some excellent responses were seen.

Summary of key points

- Candidates should be mindful of the number of marks available for each question and ensure that explanations are given if they are required
- Candidates should ensure that the details of the specified practicals are included in their revision.
- Improved attention to examiners instructions in displaying mathematical answers to the correct degree of accuracy is needed.
- Improved attention to the information given in the stem of the question will help in responses to AO3 style questions.

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