GCE AS EXAMINERS' REPORTS

BIOLOGY
AS

AUTUMN 2020

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COMPONENT 1: BASIC BIOCHEMISTRY AND CELL ORGANISAION

General Comments

The size of the cohort for this component was much reduced compared to previous series. However, the overall standard of the candidates was very good with some excellent responses seen. The facility factor for most questions was high, but the rigour of the paper was deemed to be similar to those set previously.

Comments on individual questions/sections

1. This question required candidates to demonstrate a knowledge and understanding of the biochemistry of lipids.

(a) Almost all candidates were able to name the ester bond and to identify the glycerol portion of the triglyceride from the diagram. Candidates had more difficulty with the definition of a polymer in part a) iii) with many omitting to state that a polymer is a chain of monomers. Almost all candidates could describe the ethanol test for triglycerides. Most candidates were able to identify the saturated fatty acid from the diagram and were able to explain in detail how a diet high in saturated fat could lead to an increased risk of coronary heart disease.

(b) Most candidates who sat the paper were able to explain, using data given in the table, that triglycerides yield more energy per unit mass than carbohydrates. Fewer candidates were able to clearly state the advantage of using triglyceride as a food reserve in seeds. It should be emphasised that the use of lipid as a storage molecule provides an energy-dense store which allows seeds to be smaller and lighter.

2. This question required candidates to apply their knowledge and understanding of cell membrane structure and the process of secretion.

(a) This part was answered very well, on the whole, with several candidates scoring full marks. Some candidates did struggle with part (ii), the most common error being to omit an explanation for the stain not binding to the fatty acid portion of the phospholipid bilayer. The calculation was particularly well answered although a few candidates were not able to convert between units.

(b) This section contained a synoptic question relating to AS component 2 which was well answered across the cohort. Candidates showed good, detailed knowledge of the process of secretion and were able to construct logical and coherent responses in both parts (ii) and (iii). The link between ATP production by mitochondria and enzyme secretion was clearly well understood by most candidates.

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3. This question examined the candidates' ability to apply their knowledge and understanding of the effect of changing temperature on the rate of an enzyme catalysed reaction and the levels of protein structure. It also tests the candidates' ability to critically evaluate the design of an investigation by identifying variables and potential sources of error.

(a) Most candidates were able to identify at least one controlled variable in this part and a majority were also able to identify at least one source of inaccuracy. On the whole, suggestions for improvements in accuracy were correctly linked to the named source of error and were logical and achievable with normal laboratory equipment. The commonest sources of error identified were the subjective method for identifying the end point of the reaction and the fact that the temperature could vary over the course of the investigation. A few candidates noticed that there was no mixing step in the method given and this was also credited.

(b) The graph was generally well drawn and plots were accurate in the vast majority of cases. The commonest error in this section was mis-labelling of the dependent variable with many candidates missing the word "mean" from the label. It should be emphasised to candidates that where a mean is calculated and plotted on the graph, this should be indicated in the axis label. Some candidates omitted a value at the origin of one or other of the axes. Although both axes were mostly labelled as zero it should be made absolutely clear that the value refers to both axes.
In part (ii) the best responses were from candidates who first clearly described the trend shown by the curve and then went on to construct a logical explanation for the changes in the mean time taken for the milk to become clear. Referring to specific ranges (e.g. between 8^{o}C and 42^{o}C) was an effective way to break the curve down and allowed marks to be accessed easily.

(c) This section was well answered and many candidates gained full marks.

4. This question required candidates to demonstrate a knowledge and understanding of protein synthesis.

(a) This section was very well answered and had the joint highest facility factor of all the sections.

(b) This section was also very well answered and the calculation was particularly well done. Many candidates were able to apply their knowledge of protein synthesis to the scenario set in the question and were able to link easily between the hydrolysis of DNA and the inability to synthesise functional proteins.

5. This question required candidates to demonstrate a knowledge and understanding of the stages of mitosis and the differences between mitosis and meiosis.

(a) Most candidates were able to correctly identify the three stages of mitosis from the photomicrograph. The majority were also able to explain that root tip tissue was suitable for the observation of mitosis because it contains meristem tissue. A surprising number were, however, unable to develop the

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explanation further to state that this meant that root tips would therefore contain many cells undergoing mitosis at any given time.

(b) It was pleasing that a large number of students were able to deduce correctly from the data given in the table, that interphase was the longest stage in the cell cycle and were able to clearly explain their logic with reference to the data provided.

(c) In this part, candidates demonstrated sound reasoning in linking the action of dinitroaniline on spindle microtubule formation to the likely effect on the chosen stage of mitosis. Many were also able to deduce the likely effect of this herbicide on the growth of the plant and to explain their reasoning. This part had the joint-highest facility factor on this paper.

(d) Most candidates were able to state the correct number of chromosomes in part (i). Candidates had more difficulty explaining the advantage of producing plants via runners as opposed to seeds for commercial growers. Some candidates stated the selective advantages of this type of propagation in terms of natural selection and were thus unable to access the marks available. Many candidates did however give well-reasoned explanations of the advantages in terms of retaining desired characteristics and producing new plants in less time.

6. This question assessed the quality of extended response (QER). The best answers fully addressed the three aspects covered in the question. Most candidates managed at least a superficial comparison of virus and human cell structures and better candidates were able to give very detailed comparisons covering most or all of the indicative content. Accounts of starch digestion tended to be rather abstract and limited to descriptions of the action of amylase enzyme. Better candidates gave highly detailed descriptions of viral RNA replication within the host cell nucleus. The very best candidates wrote accounts that covered all points of the indicative content. Some candidates correctly reasoned that the RNA had to be replicated twice to give an exact copy of the viral template. The third section on the synthesis of capsid proteins proved to be the most challenging section of the QER question. However, some excellent answers were seen and the strongest candidates gave very detailed accounts of protein synthesis easily accessing the top band of marks.

Summary of key points

Candidates should take care to use scientific vocabulary in their responses and ensure that their answers are detailed enough to access all the mark points available.
Candidates should take care when answering mathematical questions to ensure they take notice of the units used and how the answer should be expressed.

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COMPONENT 2: BIODIVERSITY AND PHYSIOLOGY OF BODY SYSTEMS

General Comments

The size of entry was much reduced in this series, consequently overall variety in the quality of responses was less. Most questions were accessible to all candidates and the number of questions not attempted was extremely low. The demand of the questions was comparable to the demand of questions set in previous examinations in this component. A number of questions required candidates to make three or four distinct points, and the best responses did so succinctly and with clarity. Weaker responses lacked clarity because of poor written communication, missed the point of the question or were inaccurate because of lack of preparation. The lowest facility factor was for question 2 (c) which tested AO3, in particular the ability to 'develop and refine practical design and procedures.'

Comments on individual questions/sections

1. (a) This was generally well answered; the best responses in part (i) clearly described gas exchange between the fluid lining tracheoles and muscle cells, though one-word answers were accepted.
In part (ii) the best responses described both ability to close spiracles and the presence of hairs, weak responses referred to 'a waterproof exoskeleton' which could not be accepted because the question explicitly asks for adaptations of the **tracheal system.** Candidates should be encouraged to read questions carefully.
In part (iii) the simple calculation caused some difficulty, the best responses measured the scale bar in millimetres and correctly converted to micrometres leaving a simple division, the poorest measured in centimetres making the conversion more difficult, a small minority of responses measured the photograph not the scale bar even though the question directed them to the scale bar. Candidates should be encouraged to measure in millimetres and be given practice in calculation of magnification using both scale bars and size of image÷size of specimen.

(b) This was also generally well answered; the best responses in part (i) showed a clear understanding of the design of the experiment describing accurate features such as 'volume of exhalation' or 'volume of gas in syringe', the poorest responses were knee-jerk answers such as 'humidity' or 'same syringe.
In part (ii) the best responses related pressure changes in the abdomen to movement of air through the tracheal system, there were some intermediate responses describing pumping of air, the poorest responses referred to diffusion of oxygen and carbon dioxide and a small number incorrectly referred to a diaphragm.
Part (iii) involved drawing a bar graph and in most responses scales were well-chosen for both axes, the axes were clearly labelled and the bars drawn with a ruler accurate to half a small square. The poorest responses were line graphs or bars drawn free-hand.

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In part (iv) a minority of responses recognised the levelling off the graph, the best responses clearly described the trend up to 3 breaths and the levelling beyond, as well giving plausible explanations**.** Candidates should be encouraged to select scales which allow them to plot values accurately, to assign a value for the origin on both axes, and to look out for the levelling off of data which is common in Biology.

2. (a) The best responses to part (i) gave clear descriptions of all four marking points, there were many responses with good explanations of cohesion which included the importance of hydrogen bonding. The most common omission was the point about adhesion of water molecules to walls of xylem vessels, and there was lack of clarity about the term 'tension'. Weaker responses made just one relevant point. Candidates should be encouraged to review their responses and to ensure that they have made a number of distinct points which matches the marks available, shown in square brackets after each part of the question.
Most responses to part (ii) made reference to active transport and/or water potential but there was often a lack of clarity. The best responses specified that endodermis cells/pericycle cells actively transport ions into xylem and made reference to the symplast or vacuolar pathways.

(b) In part (i) most responses showed an ability to extract the relevant values from the text and to calculate the volume of a cylinder by substituting into the formula provided, however correctly converting the answer into a value **per hour** was seen less often. In weaker responses the symbol h (height), used in the formula for volume of a cylinder, was incorrectly assumed to represent hours even though the key explained that it was representing the distance moved by the air bubbles. Candidates should be encouraged to carefully read any keys provided with formulae/equations.
Most responses in part (b)(ii) described an alternative fate for water in plants other than transpiration; weaker responses referred to possible defects in setting up the potometer.
In part(b)(iii) most responses correctly predicted a reduction in water uptake with xerophytic plants, explaining that they were adapted to reduce water loss. The best responses gave an example of an adaptation together with a clear explanation of how the adaptation reduces water loss. Weaker responses referred to adaptations which 'prevent' water loss or gave no explanations. Candidates should be discouraged from using the word 'prevent' in the context of plant water relations.

(c) This was the part of the question that caused the greatest difficulty. This question examined AO3, in particular the ability to 'develop and refine practical design and procedures.' Many responses recognised that the hairdryer generated heat as well as air speed. The best responses also described the need for repeat readings and calculating means, the lack of precision and the small number of air speeds used. They also described other variables that needed controlling as well as setting up a control experiment where transpiration was blocked using petroleum jelly. Candidates should be given opportunities to refine the design of experiments with practical exercises they actually carry out. They should be encouraged to consider the reasons for repeat readings and calculating means, the precision of all measurements, the number of values for the independent variable (at least 5 for a good graph) and should also design control experiments where appropriate.

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3. (a) Part (i) required candidates to interpret a graph of pressure changes against volume changes in the left ventricle. There were very few responses seen which gained all four marks. Candidates will have seen a graph of pressure changes against time, so it is possible that they assumed the horizontal axis was time, which would make this graph impossible to interpret. Candidates should be encouraged to read axis labels carefully, also in the context of the cardiac cycle it would be helpful for them to think of reductions in volume as contractions and increases in volume as relaxations.
For part (ii), most responses had correctly extracted SV from the graph and successfully substituted the value into the formula provided, weak responses were a result of errors in arithmetic.

(b) Part (i) was straight recall, the best responses gave the full technical term 'chordae tendineae', though not required at this level. Responses such as 'tendons' or 'tendinous cords' were accepted, a relatively common weak response of 'heart strings' was not accepted.
In part (ii) many responses were seen which referred to the closing of AV. Better responses included a description of the pressure changes responsible, and the best responses also included correct descriptions of the consequences of more oxygenated blood being delivered to the lungs. Candidates should be encouraged to review their responses and to ensure that they have made a number of distinct points which matches the marks available, shown in square brackets after each part of the question.

4. (a) This required recall of definitions of feeding types, the best responses gave clear concise definitions of both holozoic and heterotrophic. Weaker responses confused the terms with other terms, and some lost marks because of poor quality of written communication.

(b) In part (b)(ii) most responses referred to the international nature of the language used, some attempted to explain its significance to phylogeny, but these responses were often vague or inaccurate.

(c) This tested AO3, in particular the ability to 'make judgements and reach conclusions'. The best responses made a logical choice for a site for cellulose digesting bacteria and gave a clear and plausible reason for their choice. Candidates need to practise this aspect of AO3, they should be given multiple opportunities to draw conclusions from a range of secondary sources.

(d) Part (i) tested AO2 and required knowledge of phylogenetic trees to be applied to a particular example of a phylogenetic tree. The majority of responses correctly extracted the value of 85 million years ago, the most common incorrect response was 60 million years ago. Candidates are often asked to interpret phylogenetic trees in this component, they need to practise interpreting phylogenetic trees and to become familiar with the terms 'common ancestor' and 'most recent' or 'last' common ancestor.
In part (ii) the best responses recognised 'amino acid sequence' as the information contained in haemoglobin molecules, and concisely explained its use in constructing a phylogenetic tree. Weaker responses described the comparison of amino acid sequences but stopped short of explaining how this would be used in constructing a tree so lost marking point D. The weakest responses made reference to DNA sequences or even 'amino acid base' sequences. Candidates should be encouraged to review their responses and to ensure that they have made a number of distinct points which matches the marks available, shown in square brackets after each part of the question.

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5. This question assessed quality of extended response (QER). This question was marked using a banded approach. The properties of a good response in each band are described in the marking scheme along with indicative content. The best responses gave detailed accounts of all three components of the indicative content i.e. described similarities and differences systems, advantages, and disadvantages of the various types of circulatory system. Weaker responses addressed similarities and differences but not advantages or disadvantages. The weakest responses made rudimentary comments about fish or insect without reference to the types of circulatory systems. Candidates should be encouraged to identify a number of components (usually 3) in the question and to make sure that their response addresses all of the components.

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