GCE EXAMINERS' REPORTS

AS BIOLOGY (NEW)

SUMMER 2016

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BIOLOGY - NEW

General Certificate of Education

Summer 2016

Advanced Subsidiary/Advanced

Unit 1 – Basic Biochemistry and Cell Organisation

General Comments

This was the first paper of the new specification and the questions were written to meet the new assessment objectives. As such, many of the candidates found the paper challenging, especially as the new assessment criteria only allow for approximately one third of the marks to be gained from 'recall' of knowledge. As expected, candidates' responses showed a wide range of marks; from those who clearly demonstrated their ability to apply their knowledge, to those candidates who had simply learned a collection of facts. The increase in mathematical context and assessment of practical skills were also issues for a significant number of candidates. Due to the novel contexts in which these questions are presented, candidates would clearly benefit from using a highlighter pen in the exam. This would allow them to pick out the key information provided, so that they can 'focus in' on the biology relevant to the question.

Comments on Specific Questions

1. This question required candidates to demonstrate a knowledge and understanding of mitosis.

    (a) The vast majority of candidates correctly identified the stages of the cell cycle and that the structures stained were chromosomes. In aiii, many candidates recognised that DNA would be stained, however, they failed to link this to the DNA found in mitochondria. A small minority candidates made no attempt at answering the question.

    (b) This assessed the candidate's mathematical skills. The majority correctly calculated that five replication cycles would occur during the four day period, but most simply multiplied this figure by 30 000 instead of doubling 30 000 five times. Some candidates who made the correct calculation dropped a mark as they failed to give their answer in standard form.

2. This question required candidates to apply their knowledge and understanding of nucleic acids and protein synthesis.

    (a) The majority of candidates answered the question very well, with many of them gaining all four marks. Some candidates gave very good comparisons of the structures of DNA and RNA but failed to state that the epithelial cell contained DNA.

(b) Only the better candidates demonstrated their ability to apply their knowledge of transcription and translation in the production of new viral particles. In (ii) many candidates simply described transcription of the host DNA, so only gained partial marks. In part (iii), the question clearly stated "describe how the proteins are produced", it was therefore disappointing that a significant minority of candidates failed to make an attempt at an answer and of those that did, the majority were poor. In part (iv), many candidates realised that due to a lack of ribosomes, viruses would be unable to produce their own proteins. However, it was only the better candidates that also realised that they lacked the means to provide the energy required for the process.

3. This question required candidates to apply their knowledge and understanding of the ultrastructure of eukaryotic and prokaryotic cells.

(a) The majority of candidates gained both marks. However, some saw the helical structure of the chloroplast and made references to DNA and starch.

(b) The calculation proved difficult for many. Common errors involved the conversion of units, with candidates measuring in cm and then multiplying by 1000. Students would be well advised to carry out all measurements in mm.

(c) Many candidates gained marks for their descriptions of the structure of the cell wall. However, many of them went on to state that cell walls were waterproof or impermeable. Only the better candidates made the link between a change in solute concentration and water potential and therefore movement of water into and out of the cell.

(d) The majority of candidates failed to recognise that *Spirogyra* is eukaryotic and *Nostoc* is prokaryotic. Those who did demonstrated a good understanding of the similarities and differences between the two cell types.

4. This question required candidates to use their knowledge from different parts of the unit, to answer questions on the hydrolysis of sucrose, by sucrose, in a practical context. As such all three assessment objectives were covered.

(a) Part (i) was straight forward, however the majority of candidates failed to gain both marks, with many not showing water as a product. Virtually all of the candidates correctly identified the glycosidic bond but fewer than half of the candidates could explain structural isomerism. In part (iv) credit could be gained by describing the test for a protein (sucrose) or describing the test for a non-reducing sugar. The majority of students attempted to describe the test for a non-reducing sugar. Many candidates failed to gain the second mark due to simply stating the colour of the positive result as opposed to the colour change during the test. It was also clear that many students hadn't revised these biochemical tests.

(b) In part (i) the majority of students gained at least one mark. However, many made reference to controlling volumes or gave vague answers. In part (ii) very few candidates gained full marks. Common mistakes included: not having values at the origin for both the X-axis and the Y-axis, failing to label the Y-axis with <u>mean</u> absorbance of light, the Y-axis lacking units, failing to join the plots and extrapolation of the line. Part (iii) was well answered with many of the candidates gaining two marks. However, only the better candidates used the data to support their conclusions. The quality of written communication was an issue for some. The majority of candidates correctly used the calibration curve to read off the concentration of monosaccharaides, however it was only the more able that halved this number to get the concentration of glucose.

(c) This was very poorly answered, with almost 15% of candidates not attempting any answer. Very few candidates looked at the table of data or the graph they had drawn and many said they would test all pH values from 1 – 14. Another common error was candidates confusing accuracy or reliability when carrying out repeats.

5. This question required candidates to apply their knowledge and understanding of membranes and the movement of molecules and ions into and out of cells. However, this proved to be the most challenging question on the paper, with a significant minority of students failing to attempt parts of the question.

(a) This was well answered by the majority of candidates, although a common error was stating that oxygen diffuses through 'the membrane' as opposed to 'the phospholipid bilayer'. A few candidates thought that both O_2 and Na^+ would cross the membrane by the same method.

(b) Only the better candidates made the link here between the difference in percentage ion composition and the water potential of the habitat and the effects this would have on the carp. The majority of candidates made reference of the effect of the urine on the habitat.

(c) This was also poorly answered. Although in part (i) the question clearly stated the 'importance of maintaining the ion composition' many candidates linked the difference in ion composition with water potential and the loss of water from the cells. Only the more able linked the difference in ion composition to diffusion and active transport. As a consequence very few candidates recognised cell one as being from a salmon in sea water. However, the majority gained a mark for linking the number of mitochondria to ATP synthesis and active transport.

(d) Only the better candidates were awarded marks here. The majority of candidates failed to make the link between a decrease in pH and the effect that this would have on the denaturation of proteins. Of those that did, only the very best explained the effect that this would have on active transport.

6. This question required candidates to demonstrate, and apply, their knowledge and understanding of enzymes and enzyme inhibition. Candidates provide a full range of responses from those who gained full marks to those that gained none. The majority of candidates gave good explanations of the effects of both competitive and non-competitive inhibition, but failed to be awarded marks within the top-band due to a lack of detail regarding the action of pyrophosphatase. Some candidates made reference to the lock and key hypothesis or talked about the specificity of enzymes. Only the better candidates that made reference to the specificity of the shape of the enzyme's active site and the complementary shape of the pyrophosphate, which allow them to fit together to form an enzyme-substrate complex. A common error included candidates making reference to the pyrophosphatase being 'denatured' due the binding of the phenylalanine.

BIOLOGY - NEW

General Certificate of Education

Summer 2016

Advanced Subsidiary/Advanced

Unit 2 – Biodiversity and Physiology of Body Systems

Comments on Specific Questions

1. (a) Most candidates were able to give the correct ratio in (i). In (ii) there were very few references to reduction of water loss and many candidates stated that it would increase water loss. The most common response was a reference to oxygen being supplied directly to tissues. It was rare for candidates to state that a disadvantage was a limitation to size or shape.

   (b) Well answered by most candidates.

   (c) Well answered by most candidates.

   (d) Candidates often referred to metabolic rate but reference to body temperature or less energy required for support less often. There were many incorrect statements such as 'fish do not move as much as dogs' and 'fish are never as big as dogs'.

   (e) There were many excellent well argued responses, but some candidates failed to qualify a statement eg. 'The red blood cells have a biconcave shape' or gave an incorrect statement eg. 'red blood cells do not have a nucleus to make more room for oxygen'.

2. (a) Many candidates stated 'hypothesis 2' in (i) but were unable to state a correct reason. Candidates gave many disappointing and very confused responses for (ii). There were many 'sloppy' answers such as ' Related organisms have the same amino acids'. There were very few references to sequence of amino acids.

   (b) All points in the mark scheme for (i) were seen and there were some very good answers. Candidates appreciated what use could be made of a mean rate of mutation in (ii) but there were many incorrect references to being able to develop a vaccine against the new strains. In part (iii) stronger candidates were able link the degree of genetic variation to an evolutionary timeline.

3. (a) Very few candidates were able to correctly identify the dependent and independent variables with many getting them the wrong way around. Parts (ii), (iii), (iv), and (v) were all answered well.

   (b) Many candidates were able to define very clearly and concisely the meaning of 'genetic polymorphism' but others considered that the snails could change their colour and banding pattern in a 'Chamaeleon' way to adapt to changes in their surroundings. In part (ii) there were some very good, well argued responses but many more very confused.

4. (a) Most candidates were able to give correct responses in (i) but many thought that respiration also uses water. Candidates lost marks in (ii) by referring to size or number of leaves and not to surface area. An alarming number ignored the stem of the question and gave temperature and light intensity as variables which would need to be controlled.

(b) Many candidates merely stated the distribution of stomata and gave no explanation.

(c) The involvement of a reduced water potential, osmosis and turgor pressure in the opening of stomata was explained well but very few candidates were able to state how an increase in turgor in the guard cells shown would result in the opening of the stomata.

(d) Calculations of the total circumference of stomata were usually correct in (i), but many candidates did not give the result to three significant figures. An issue in (ii) was that many candidates referred to size or number of stomata rather than to circumference.

5. (a) Very few candidates were able to make the link between the shape of the human oxygen dissociation curve and the ability of humans to live at altitude to gain credit in (i). References to haemoglobin were common in (ii) and usually worthy of credit. Very few candidates referred to an increase in red blood cell count. There were many valid responses for (iii), but an alarming number of candidates had ignored the information in the stem of the question and assumed that Ascaris lived in the soil.

(b) There were many excellent definitions of convergent evolution for (i). However, for (ii), it was not generally appreciated that a higher partial pressure of oxygen would be required to saturate haemocyanin at higher temperatures. Again in (iii), many candidates did not appreciate that as the temperature increases more oxygen will be released to the tissues. Many references were made to diffusion rates from the water into the crab.

6. (a) In Part (i), very few candidates referred to the lateral movement of ions from the xylem into the phloem. Candidates often referred to the movement of ions in the xylem but many stated that ions moved upwards in the phloem as well. Candidates found it difficult to express clearly the need for a control in (ii).

(b) The question in (i) clearly asks for conclusions about the transport of ^{14}C in xylem and phloem. Many candidates made no mention of xylem and very few referred to movement in the phloem in both directions. Correct responses of how the experiment could be refined to determine the direction of transport of ^{32}P in (ii) were seen.

(c) There were some excellent responses but others referred to an increase in the sugar levels in a leaf leading to a decrease in water potential and movement of water into the leaf by osmosis no reference to phloem being given. Candidates appreciated that starch was stored in the tuber and used for growth in the spring.

7. Correct detailed references to the sites of protein digestion were rare. Exopeptidases and endopeptidases were commonly confused and there were many references to the protein nature of cellulose and to the absorption of proteins from the stomach and small intestine. Some candidates correctly stated that amino acids were absorbed from the small intestine into the blood, a statement then ignored when referring to the horse. Many candidates did not refer to the diagrams given and did not appreciate that protein made by bacteria in the caecum of the horse would not be digested or absorbed. Many candidates gave a description of the digestion of cellulose and did not refer to protein. Many made no attempt to explain why the manure of a horse has a higher organic nitrogen content or why horses require a diet much richer in protein.

WJEC
245 Western Avenue
Cardiff CF5 2YX
Tel No 029 2026 5000
Fax 029 2057 5994
E-mail: exams@wjec.co.uk
website: www.wjec.co.uk