CARIBBEAN EXAMINATIONS COUNCIL

REPORT ON CANDIDATES' WORK IN THE CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

JANUARY 2014

BIOLOGY
GENERAL PROFICIENCY EXAMINATION

GENERAL COMMENTS

The January 2014 sitting of the CXC Biology examination consisted of three papers: Paper 01 — Multiple Choice; Paper 02 — Structured/Extended Essays and Paper 032 — Alternative to School-Based Assessment (SBA).

Candidate performance on this examination was slightly better than in the previous sitting of the January examination. The examining committee continues to hope that candidates and teachers will continue to pay careful attention to the comments and suggestions being offered in this and previous reports to ensure that improvements are sustained.

The committee would like to reiterate once again that greater attention needs to be paid to the following list of recommendations prepared to further enhance the future performance of candidates based on observations of their performance on this sitting of the examination.

- Practice reading questions carefully and planning responses so that answers are organized in a logical and cohesive manner.
- Review and become familiar with the glossary of terms at the back of the syllabus. This will aid the understanding of key words such as *annotate*, *describe* and *explain* when reading the questions.
- Be guided by the mark allocation and quantitative descriptors within the text of the question as far as possible. This will help interpretation of what is being asked and minimize/prevent the giving of irrelevant information in responses.
- Use biological jargon as required in expressing biological phenomena as this increases the accuracy of descriptions and reduces errors caused by oversimplification.

More emphasis should be placed on developing practical skills in the teaching of biology.

Planning and designing and drawing skills continued to be problematic for candidates and negatively impacted their performance in responding to questions on Paper 032 — Alternative to the SBA. Too many candidates seemed unfamiliar with basic laboratory equipment and material and even the simplest biological/scientific methods. Candidates demonstrated particular weakness in identifying precautions, formulating hypotheses, designing suitable procedures for carrying out investigations and writing conclusions.

DETAILED COMMENTS

Paper 01 – Multiple Choice

Paper 01 consisted of 60 multiple-choice items. Performance on this paper was quite similar to that of 2013. Some of the topics that were most problematic for candidates were:

- The nitrogen cycle
- Deficiency diseases
- Transport in plants
- Plant storage organs
- Excretion in plants
- Sensitivity in animals
- Reflex arc

Paper 02 – Structured and Extended Essays

Paper 02 consisted of six compulsory questions. Questions 1 to 3 were in the structured response format and Questions 4 to 6 in the extended essay format. Most candidates were able to score marks across the range for almost all questions.

Question 1

Syllabus Objectives: B1.2, 2.1, 2.2, 3.1, 3.2, 3.4

This question tested candidates' practical knowledge of respiration in living organisms and to a lesser extent photosynthesis. Although candidates were able to access marks across most of the range (0–23), their performance was generally poor. The mean mark awarded was 8.

Candidates were given an incomplete diagram of apparatus used to test the hypothesis that both green plants and small animals produce carbon dioxide during aerobic respiration.

In Part (a) (i), candidates were required to identify the materials that should be placed in each jar to investigate carbon dioxide production during aerobic respiration. In setting up this experiment, it is important to note the function of each jar: Jar I contains soda lime or other compound which will remove carbon dioxide from the incoming air, since this is the gas produced during aerobic respiration and which will be tested for in Jar IV containing the lime water. Jar II also contains limewater to test that the air which enters Jar III containing the test organism (either small animal or green plant) is free of carbon dioxide. Once this is understood, candidates would not try to test

both organisms simultaneously either by putting one in Jar II, or by putting both plant and animal in Jar III.

The more able candidates accurately stated that *Jar I should have soda lime, Jars II and IV should have lime water and a small plant or animal should be placed in Jar III*. Very few candidates stated that *Jar I should contain soda lime to remove or absorb the carbon dioxide in the air prior to exposing it to the named organism in Jar III*. A few candidates also misinterpreted *both* in the stem of the question to mean that both a plant and an animal organism should be placed in Jar III. Most candidates were able to state for Part (a) (ii), that *in Jar IV, lime water which is clear becomes milky white*. Those who stated that carbon dioxide would be observed did not get marks since the gas cannot be observed directly.

In Part (b), candidates were told that in order to test the hypothesis using plants only, a piece of black cloth is used to modify the apparatus. Then in Part (b) (i), they were asked to describe how the apparatus in the diagram given is modified to test the hypothesis that plants produce carbon dioxide during aerobic respiration. Several candidates responded correctly by stating that *a small plant would be placed in Jar III and then the jar would be covered with a black cloth*. They were also able to explain in Part (b) (ii) that *the black cloth in the experiment prevents the plant from photosynthesizing* and that *some of the carbon dioxide produced during respiration is used up in the photosynthesis*. However, the responses of some candidates to both Parts (b) (i) and (ii) indicated that the notion that green plants do not respire during the day when photosynthesis is proceeding, still persists. This may be clarified if teachers point out that only the chlorophyll containing parts of the plant are photosynthesizing and that the non-photosynthesizing parts require energy to carry out their functions (for example: storage, cell division and growth). The CO_2 produced from respiration is masked since the plants are using it up during photosynthesis. This information also helps students to understand the CO_2 compensation point later on. In this experiment, the plant was kept in the dark to prevent the carbon dioxide produced in respiration from being used up in photosynthesis.

Some candidates had difficulty with Part (b) (iii) where they were asked to suggest two precautions related to the experiment. They were expected to give answers including *sterilizing jars to ensure no microorganisms are in it*; *ensuring that the glass tubing was inserted below the level of the limewater*; or *ensuring that live organisms were used*.

Part (c) (i) asked candidates to write a chemical equation to summarize aerobic respiration. Most candidates were able to gain at least one mark for either stating correct reactants (oxygen and glucose) or products (carbon dioxide, water and ATP/energy). Candidates who gave the equation for photosynthesis did not get marks for their response.

In Part (c) (ii), most candidates were able to correctly explain that *aerobic respiration was important to living organisms to get energy from food to perform activities such as growth, locomotion and reproduction*. Some candidates had the misconception that aerobic respiration is the same as breathing.

Part (d) was also well done as most candidates were familiar with examples of at least two end products of anaerobic respiration, namely *carbon dioxide*, *ethanol* or *small amounts of energy/ATP*. *Lactic acid* was also awarded marks as there are some anaerobes that produce lactic acid as a respiratory product.

Several candidates successfully completed the table in Part (e) to distinguish the process of photosynthesis from respiration. It was observed that a few candidates incorrectly identified the organelle in the case of photosynthesis as chlorophyll instead of naming the chloroplast. Some candidates were unable to gain marks because they could not name at least two raw materials or two final products of each process.

Question 2

Syllabus Objectives: B7.11; C 3.2, 3.3, 3.4

This question tested candidates' knowledge of the structure of mammalian skin and genetic terms as well as their ability to use genetic diagrams to explain inheritance of albinism. Candidates' performance on this question was also poor even though some of them were able to gain the maximum 15 marks. The mean score was 6.

In Part (a), candidates were given a diagram showing a vertical section through the mammalian skin. Part (a) (i) required that they identify the structures labelled A to D. Several candidates were unable to identify all four structures, especially the epidermis (A), which some simply called the outer layer and were awarded no marks. Structure D, the sweat gland, was sometimes incorrectly called a network of blood vessels. It is important to note that marks were not awarded if the labels were spelt incorrectly.

Part (a) (ii) was well known and most candidates were able to identify that the largest quantity of melanin should be in the malpighian layer or basal layer of the epidermis as it helps to protect the skin from damage by UV light.

In Part (b), candidates were told that albinism is characterized by a lack of melanin in the skin and that the genotype of someone with an albino phenotype is aa. They were then required in Part (b) (i) to define the terms *allele*, *genotype* and *phenotype*. This posed the most difficulty for candidates and several of them did not attempt a response. Candidates were expected to know

that the term *allele* refers to *alternative forms of a gene which normally occurs in pairs*. Some candidates simply gave symbols such as A and a to represent alleles without giving an explanation. These candidates were awarded no marks. Most candidates defined genotype correctly as a pair of alleles; and the phenotype was explained as the physical expression of the genotype.

An example of a good candidate response to this part of the question is given below.

> *Alleles are alternative forms of the same gene with contrasting characters found in the same relative positions on homologous chromosomes.*
> *Genotype is the genetic make-up in terms of alleles for a certain characteristic.*
> *Phenotype is the visible effect of a genotype.*

In Part (b) (iii), candidates were required to use a genetic diagram to explain how two non-albino parents could produce an albino offspring. Candidates were expected to draw a genetic diagram similar to the one below.

Parent genotype: **Aa** X **Aa**

Gametes: **A** **a** X **A** **a**

Fertilization:

	A	**A**
A	**AA**	**Aa**
A	**Aa**	**Aa**

Expected genotype: 1AA 2Aa 1aa

Expected phenotype: 3 Non-albino to 1 albino offspring

Candidates should be reminded that when asked to draw genetic diagrams, their response must include the allele in each gamete from each parent, as well as an illustration consisting of either a Punnett square or a line diagram, showing how the gametes from each parent could pair up during fertilization. Some candidates simply stated the expected genotype, ratio and/or phenotype of the offspring without correctly showing the pairing of the gametes.

Part (b) (iii) required that candidates suggest the genotypes of parents who would never have albino children. This was generally well done as candidates were able to correctly state *AA X AA* or *AA X Aa*.

Question 3

Syllabus Objectives: B 9.6, 9.7, 9.8, 9.11

This question examined candidates' ability to relate the structure of flowers to their method of pollination, as well as their knowledge of the sequence of events which take place after pollination that give rise to fruit formation, and methods of seed dispersal. Performance on this question was very poor. Candidates were able to score across the full range (0–15), but the mode was 0 and the mean was 6.

Candidates were given two diagrams of two flowers labelled X and Y taken from two different plants. Part (a) (i) asked them to indicate on each flower, the parts that give rise to the male gametes; and in Part (a) (ii), they were required to suggest the agent of pollination for each flower. These were generally well done as most candidates appeared to be familiar with the position of the anther and common features of insect and wind-pollinated flowers. Many candidates ignored the instruction to label the structures (anthers) M and labelled all the parts of the flower.

Part (b) (iii) required that candidates suggest two features of each flower that makes them suited for the type of pollinating agent suggested in Part (b) (ii). This was sometimes well answered as candidates correctly named *large petals, the presence of both an anther and a stigma* or *nectar at the base* as features suited for pollination by an insect in the case of Flower X; and *long feathery stigma, long filaments hanging out of flowers* or *having small inconspicuous petals/no petals* in the case of Flower Y. A common misconception observed in several responses to Part (b) (iii) was that the position of the anthers in relation to the stigma was an important feature for insect pollination. This feature is significant for self- vs. cross-pollination.

In Part (d), candidates were asked to describe the sequence of events which takes place after pollination to give rise to a fruit. Although most candidates were familiar with some of the events, many had some difficulty describing how the pollen was able to travel to the ovary and the events leading up to fertilization were sometimes not clearly described. An example of a good candidate response that was awarded full marks was:

> *The pollen grain forms a pollen tube in which two male nuclei travel to the ovary. They pass through the micropyle and fertilize the ovum. These ova develop into seeds and the ovary into a fruit.*

In Part (c), candidates were given a diagram of a fruit formed from one of the flowers and asked to suggest two methods of dispersal of the seeds found inside the fruit. Most candidates were awarded full marks for this section as they were able to state animals or explosive or mechanical methods.

Question 4

Syllabus Objectives: B1.1, 1.2, 1.5, 1.6

This question tested candidates' knowledge of the structure of plant and animal cells, functions of organelles unique to plant cells, as well as the behaviour of each of these cells in dilute solutions. It also examined their understanding of the importance of osmosis and diffusion in living systems. Candidate performance on this question was very good. There was general familiarity with the topics and candidates were able to gain marks across the full range (0–15). The mean was 9 marks.

In Part (a) (i), candidates were asked to make labelled drawings to show the structures of a generalized plant and a generalized animal cell. Most candidates were able to produce representative drawings of both cells but some candidates were not awarded marks because labels were spelt incorrectly. Many candidates did not indicate whether the cell drawn was an animal or plant cell. It was also observed that several candidates drew the organelles disproportionately. The nucleus is usually the largest of the organelles but sometimes it was drawn as the smallest organelle and the large permanent vacuole of the plant cell was sometimes drawn very small relative to the other organelles. It was also observed that the drawings were generally untidy and in many cases the rules governing biological drawings were not followed. Candidates should be reminded that labels should be on one side of the drawing and label lines should be drawn with a ruler. Drawing lines should be clean continuous lines as well.

In Part (a) (ii), candidates were asked to name two organelles which are unique to plant cells and suggest the significance of these organelles to the survival of the plant. A few candidates were not awarded marks for identifying chlorophyll as an organelle instead of chloroplasts.

In Part (b) (i), candidates were asked to explain the effect on each type of cell if each was placed in a container of distilled water for 15 minutes. They were then required to explain, for Part (b) (ii), how the process responsible for the results would differ from that by which gases move in and out of leaf cells. A common misconception was that water cannot enter plant cells because of the cell wall.

For Part (b) (ii), candidates correctly made reference to Part (b) (i), even though the question cited Part (c). Good responses were usually given as most candidates were able to explain that

the process involved in the movement of water into each type of cell was osmosis and the absence of a cell wall would result in animal cells bursting while the plant cell would get turgid. A good candidate response for both sections was:

> *Osmosis would occur through the cell membranes of both the animal and plant cell. The plant cell would become turgid and not burst because of the support from the cell wall. The animal cell may burst since the water content inside the cell would be too much for the membrane to hold.*
>
> *The process involved in the results in Part (b) (i) is called osmosis which involves the movement of water molecules. The process through which gases move in and out of leaf cells is called diffusion — the movement of particles from a region of high concentration to a region of low concentration until they are evenly distributed.*
> *Osmosis involves water molecules while diffusion is associated with particles.*

It is being suggested that teachers create crossword puzzles, word sleuths, cryptograms (online puzzle makers) and use them to help students develop their capacity to spell correctly, as well as give students opportunities to practice drawing and labelling parts of living organisms. Practical use of 3D cell models would also assist students preparing to sit these examinations to become more familiar with the cell organelles.

<u>Question 5</u>

Syllabus Objectives: A2.6, 2.7, 4.1; B2.11; E 5.1, 5.3

This question tested candidates' knowledge of aspects of the nitrogen cycle and the consequences of nitrogen deficiency in plants as well the effect of nitrate fertilizers on aquatic organisms and solutions to the problem. Most candidates were able to gain marks across most of the range (0–15) but overall performance on this question was generally poor. The mean for this question was 5 and the mode was 4.

In Part (a) (i), candidates were required to draw a simplified labelled diagram of the nitrogen cycle to show three processes that involve bacteria and one process that does not involve bacteria. Most candidates' responses suggested that they were familiar with most of the stages involved in the cycle but they did not identify that bacteria are involved in nitrogen fixation in the soil/root nodules of leguminous plants, nitrification, decomposition of organic waste such as urea and de-nitrification. A few candidates correctly identified that the role of lightning in nitrogen fixation does not require bacteria.

Quite a few candidates confused the nitrogen cycle with the carbon cycle and listed photosynthesis and respiration as processes which do not require bacteria.

The consequences of nitrogen deficiency required in Part (a) (ii) were widely known. An example of a succinct candidate response to this question is given below.

> *Nitrogen is needed to make proteins in plants. Plants that are nitrogen deficient will be protein deficient also, hence they will have poor, stunted growth and yellow spindly leaves*.

Part (b) (i) asked candidates to explain how excess nitrate fertilizer may be responsible for the overgrowth of algae and death of the aquatic organisms. Many candidates found this part difficult as it appeared they were unfamiliar with eutrophication. Candidates were expected to explain that

> *nitrate fertilizers are washed into the rivers and aquatic organisms such as algae are able to use the nitrogen from the fertilizers to make protein for growth and reproduction. This allows them to multiply and use up some of the oxygen from the water. Since they mostly live on the surface of the water, they also block sunlight from reaching the other organisms, in particular the plants with leaves below the surface of the water, so they are unable to photosynthesize and die*.

Part (b) (iii) required candidates to discuss three ways in which the problem could be remedied. This was generally well done. An example of a candidate response that was awarded full marks is:

> *One solution is that the farmers utilize another type of fertilizer that does not contribute to eutrophication, such as an organic one. This will prevent any more excessive growth of algae in the river.*
>
> *Another solution is that algae could be completely eradicated from the river. Therefore, there can be no overgrowth if there are no algae.*
>
> *Another solution would be to educate farmers about using fertilizers when they have planted near rivers. If farmers are educated about the best places to plant their crops, they would make wiser decisions therefore reducing the problem of eutrophication.*

Question 6

Syllabus Objectives: B2.6, B2.10

This question examined candidates' knowledge of the internal structure of a tooth and the functions of the different parts. It also tested their ability to relate the structure and role of the different types of teeth to consumption of a varied diet. Mechanical digestion of food was also tested. Candidate performance on this question was satisfactory, with a mean of approximately 8 and a mode of 8. Candidates earned scores in the range 0–15 out of a maximum score of 15.

In Part (a), candidates were asked to use an annotated diagram in describing the functions of the enamel, dentine and pulp of a named tooth. Poor drawing quality and untidy annotations were a feature of most responses to Part (a) and marks were not awarded for incorrectly spelt labels. Several candidates were familiar with the fact that the enamel is the hard outer covering which allows physical breakdown of food, and that it protects the softer inner layers of the tooth. However, many did not know that the dentine is the layer under the enamel and it contains cytoplasm which provides nutrients such as calcium to the tooth. The pulp cavity was poorly represented in many cases.

Part (b) was very well done and most candidates were able to relate the roles of the different types of teeth in the mouth to having a varied diet and further stated how this is beneficial to a mammal. Candidates were able to explain that having a varied diet allows the individual to get a wide range of nutrients from eating a range of foods that also helps to ensure that the diet is balanced. They also said that persons are less likely to suffer from deficiency diseases and get a range of components (for example, fibre) to support their health.

In Part (c), candidates were told of an 80-year-old man who lost his teeth and were asked to explain how this would affect his ability to digest food. Candidates were also required to suggest how he could obtain the essential nutrients that his body requires. This was also generally well answered by candidates. An example of a good response was:

> *Not having teeth means that the man cannot chew properly. Enzymes work best with high surface area and the fact that the food is not being cut up into smaller bits means that digestion by enzymes cannot work at its best so foods and nutrients would be wasted. Large food particles also mean a harder time swallowing and defecating. The old man could go to his doctor and get nutritional supplements that are easily absorbed in his body or crush or blend his food before eating it. He could also drink liquid meal supplements.*

Paper 032 – Alternative to the School-Based Assessment (SBA)

This paper assessed the range of practical skills required of biology students and consisted of three compulsory questions. Although there was significant improvement in the overall performance during this sitting of the examination, many candidates continue to display weak practical skills especially in aspects of planning and designing (including the assembling of apparatus), describing realistic methods of experiments and producing representative drawings. These observations reinforce the need for teachers to provide opportunities for students to develop their practical skills. Once again the examining committee reiterates that candidates *must be exposed to actual experimenting and investigating scientific phenomena, discussions, explanations and rationalizing of procedures and outcomes* so that they become capable of developing and manipulating experiments and experimental data on their own.

Question 1

This question examined candidates' practical skills in planning and designing investigations involving the enzyme amylase breaking down starch at different temperatures. They were also required to demonstrate that they knew how to test for the presence of starch and reducing sugar, as well as represent data using a suitably constructed table. Candidates' performance on this question was satisfactory and they were able to gain marks across the full range (0–25). The mode was 9 and the mean was 10.

In Part (a), candidates were told that after 15 minutes a sample of amylase–starch mixture taken from each of five test tubes, each kept at five different temperatures were tested for starch. Part (a) (i) required candidates to list the apparatus, describe the procedure and state the expected result if starch is present. Several candidates were unable to list suitable apparatus such as droppers/pipettes to take each sample and place it onto a white tile or in another test tube for testing, test tube holders or stop watches. Many candidates also had difficulty describing that a dropper would have been used to first take out the sample mixture from one test tube then place a drop on white tile; then another dropper would be used to drop iodine on the sample mixture. Most candidates were able to state that the expected result would be a blue-black colour if starch is present.

Most candidates were able to score at least one mark for Part (a) (ii) which required that candidates suggest two precautions that must be taken to ensure accuracy of the results. Correct responses given included *using equal amounts of samples for the test*, as well as *ensuring that each of the mixtures is timed accurately for 15 minutes before the sample is removed*. Other

responses candidates were expected to suggest were *ensuring that the white tile/test tube containing the sample to be tested was clean*; and *using a clean dropper to obtain the samples*.

In Part (b), candidates were told that another sample of the amylase–starch mixture was taken from each of the test tubes after 20 minutes and tested for the presence of reducing sugar. The colour change results observed in each sample tested were presented in a table. Part (b) (i) asked candidates to explain how a reducing sugar could be formed in this experiment. Most candidates were able to get at least one mark for stating that the enzyme amylase breaks down starch to maltose. An additional mark was awarded if candidates also stated that maltose is a reducing sugar.

In response to Part (b) (ii), several candidates were able to suggest that a suitable aim for the experiment would be *to investigate the effect of temperature on amylase activity*. However, many were unable to gain full marks for fully explaining why the samples kept at 0, 60 and 80 ^{o}C showed a blue colour when tested for a reducing sugar as required in Part (b) (iii). Several candidates were not awarded full marks because they did not explain that *at 0 ^{o}C the enzyme was inactive due to a lack of kinetic energy*. Some also wrongly said that the enzyme was denatured at 0 ^{o}C. Candidates were expected to explain that *amylase is inactive at 0 ^{o}C so starch was not broken down to maltose/reducing sugar. The optimum temperature of amylase is below 40 ^{o}C so the enzyme is denatured at or above this temperature preventing it from breaking down starch to maltose*. Candidates were also awarded marks if they mentioned that *Benedict's reagent that is used to test for reducing sugar is blue and if there is no reducing sugar, it remains blue*.

In Part (b) (iv), most candidates were able to score at least one of the two marks for suggesting two possible sources of error in the experiment. Candidates were awarded marks for responses such as *heat would be lost to the surroundings, therefore, sample not kept exactly at a constant temperature; the volume of each sample not equal; poor mixing of the sample mixtures to be tested;* or *equal time not given to each sample before testing*.

In Part (c), candidates were told that a similar experiment was carried out to investigate the pH at which amylase optimally converts substrates to products and they were given a graph showing the results of that experiment. In Part (c) (i), candidates were asked to construct a table to represent the data shown in the graph. This was not well done by many candidates. Candidates were expected to draw a table using a ruler with the independent variable (pH) placed in the first column (or row if a vertical table was used) and the rate of reaction with the units (mg/unit time) stated in the second column. Most candidates were able to gain marks for accurately reading and recording most of the rate of reaction values at each pH from the graph. Some candidates were unable to score full marks because they did not include a title. Candidates were generally able to gain full marks for writing a conclusion for this investigation as required in Part (c) (ii). Based on the aim stated in the stimulus material, the conclusion was that amylase works optimally in

neutral (pH 7) conditions. Candidates who mentioned that amylase is denatured by low or high pH were not awarded marks as this conclusion was not related to the aim of the investigation.

Question 2

This question was based on apparatus set up to investigate the effect of light intensity on the rate of photosynthesis in an aquatic plant. Candidate performance on this question was fair. The mean score was approximately 6 out of a total of 18, and candidates were able to score marks across the range 0–18.

In Part (a) (i), candidates were required to write a hypothesis that could be tested using the apparatus shown in the diagram. Some candidates stated the hypothesis in the form of an aim or an expected observation and could not be awarded marks. Another common error was stating that 'light intensity *affects* the rate of photosynthesis'. Such a statement would not allow the experimenter to state whether the results observed either support or do not support the hypothesis since both an increase or a decrease in the rate would support the hypothesis. Candidates are being reminded that a hypothesis is an explanation based on a particular observation about how things work or why something happens. A suitable hypothesis would have been *an increase in light intensity results in an increase in the rate of photosynthesis*.

Part (a) (ii) required that candidates describe how the apparatus could be manipulated to test their hypothesis. Candidates' descriptions were expected to include that light intensity was varied by varying the distance of the light source from the photosynthesizing plant; the oxygen given out during the process was collected by the downward displacement of water in the measuring cylinder and the amount of oxygen produced at each light intensity was measured by counting the number of oxygen bubbles produced or measuring the volume of air in the cylinder after a fixed period of time. Many candidates had difficulty describing a suitable control for the investigation as asked in Part (a) (iii). Any of the following responses were accepted as a control:

Remove/turn off/cover the light source.
Maintain the light source at a fixed distance.
Remove the plant/replace with a dead plant.

In Part (b) (i), candidates were asked to identify the gas labelled in the measuring cylinder. This was answered correctly by most candidates as oxygen. Some candidates were however unable to gain full marks in Part (b) (ii) which required them to describe a confirmatory test for oxygen. Most candidates were able to describe that *a glowing splint was inserted into the measuring cylinder after quickly removing it from over the inverted funnel;* and that *the glowing splint rekindles in the presence of oxygen*. A mark was also awarded if candidates stated that the splint was lit then extinguished leaving only a glow which is inserted in the cylinder.

In Part (c), candidates were given drawings of two leaves taken from two aquatic plants found in a river. In Part (c) (i), candidates were asked to use graph paper to determine the surface area of each leaf. Several candidates were unable to determine the surface area using graph paper which involves counting the number of squares (each of which is 1 cm^2). In some cases, candidates were not awarded full marks because they did not record the units of measurement. Based on the information given in the question, it was reasonable to assume that candidates, in responding to Part (c) (ii), would have chosen Leaf B as the one found growing at 5 metres below the surface of water since the larger surface area would allow for maximum light exposure and gas exchange as well as more chlorophyll for greater photosynthesis. Candidates were also given credit for justifying their choice of Leaf A by arguing that plants growing at that depth in that environment would have narrow long leaves to reach the surface and less chlorophyll content since light is needed for synthesis of chlorophyll.

Question 3

This question tested candidates' ability to make a labelled drawing of an artery and calculate the magnification of the drawing. They were also required to explain how the artery is adapted to carry out its function, then represent hypertension data in a table using a suitable graph as well as suggest reasons for the differences in trends between males and females. Candidate performance on this question was satisfactory. The mean was approximately 8 out of 17 and the mode was 4.

In Part (a), candidates were given a drawing of the external view of a blood vessel that transports blood away from the left side of the heart of a small mammal. In Part (a) (i), they were required to produce a fully labelled drawing of the blood vessel as it would be viewed in transverse section, that is, cut along the line indicated in the diagram. Poor drawing skills prevented several candidates from being awarded the five marks allotted. Very few drawings were done with the clean, continuous lines expected and although the lumen of the blood vessel in the original drawing was small, many candidates did not represent the small diameter in proportion to the thickness of the diameter of the wall accurately. Only a few candidates were able to label their drawings correctly. Candidates are being reminded to use a ruler to draw label lines and to place labels on the same side of the drawing as much as possible. Most candidates were able to calculate the magnification of their drawing as asked in Part (a) (ii) using the formula:

$$\text{Magnification} = \frac{\text{Size of drawing}}{\text{Size of original drawing}}$$

Part (a) (iii), which asked candidates to explain how one feature shown in the drawing makes the blood vessel suited for its function, was also generally well done. The thick (elastic) walls of the blood vessel enables it to withstand the high pressure of blood being pumped from the heart; and

the small lumen helps to maintain a high pressure required to push blood to the other parts of the body. Candidates who mentioned that the thick elastic walls are able to stretch and recoil moving blood away from the heart and to the rest of the body also gained marks.

In Part (b), candidates were given data about the number of hypertension related deaths reported among males and females in some Caribbean countries from 1985 to 2000. In Part (b) (i), they were asked to draw a suitable graph to represent the data on a grid provided. Several candidates were unable to score the five marks allotted either because they used an inappropriate scale, did not label the axes correctly or did not use an appropriate key to distinguish male from female data. Most candidates were able to suggest three credible reasons to explain the difference in the number of hypertension related deaths among males and females. Reasonable explanations that gained marks were that:

Women were not exercising as much as men.
Women were consuming excess salt in their diet compared to men.
More women were overweight/obese than men.
More women were stressed than men.

These responses related to the risk factors associated with the development of hypertension which candidates should have learned.

Private candidates may also find it useful to review previous comments on performance on Paper 032 from past examinations as well as the SBA component of past May/June sittings of the examination for additional comments and recommendations relating to practical skills.