Candidates' Performance

The 2014 DSE Biology Examination was based on the Biology Curriculum (S4-6) implemented in 2009. The Biology public examination consists of two papers: Paper 1 assesses the compulsory part of the curriculum and Paper 2 assesses the elective part.

Paper 1

Paper 1 consisted of two sections, Section A (multiple-choice questions) and Section B (conventional questions). All questions in both sections were compulsory.

Section A (multiple-choice questions)

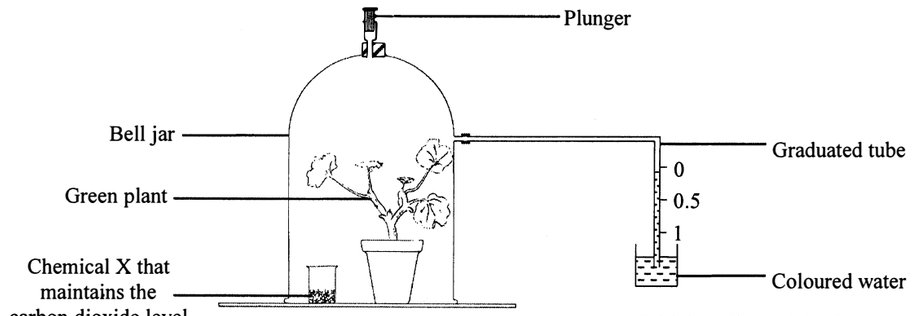
There were 36 questions in this section. Candidates' performance was satisfactory in general and the mean raw score was 21. Some candidates had areas of weakness, however, as revealed by their performance in the following items:

2. Which of the following events ***does not*** involve the functioning of membrane proteins?

	A.	Transmission of nerve impulses across a synapse	(49%)
	B.	Absorption of glucose in the small intestine	(10%)
*	C.	Transport of oxygen by haemoglobin	(32%)
	D.	Recognition of pathogens	(9%)

About half of the candidates wrongly chose option A as the answer. They were not aware that the transmission of nerve impulses involves receptor proteins at the receiving end of the synapse. Only one-third of the candidates understood that haemoglobin is not a membrane protein.

Directions: Questions 6 to 8 refer to the diagram below, which shows a set-up used to determine the rate of photosynthesis of a green plant. During the study, the position of the plunger remained unchanged.



6. Based on the results, what was the rate of photosynthesis of this plant?

*	A.	0.6 mL oxygen released per hour	(69%)
	B.	0.3 mL oxygen released per hour	(16%)
	C.	0.6 mL carbon dioxide absorbed per hour	(11%)
	D.	0.3 mL carbon dioxide absorbed per hour	(4%)

The question aimed to assess candidates' understanding of the set-up used for determining the rate of photosynthesis of a green plant. In fact, it measures the amount of oxygen released during the experimental period

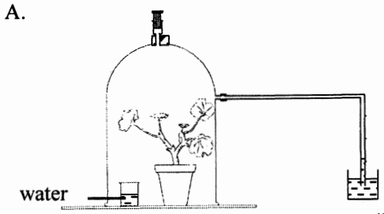
instead of directly measuring the rate of photosynthesis. The release of oxygen is a net result of gas exchange in which the rate of photosynthesis is faster than the rate of respiration. 85% of the candidates were aware that the change in the reading was a result of oxygen released from the plant. However, some of them failed to figure out the numerical value correctly from the raw data, showing that they were weak at processing quantitative data.

7. The rate obtained was lower than the actual rate of photosynthesis of the plant. Which of the following is the most probable reason for this?

* A. The plant also carried out respiration during the study. (74%)
B. The plant also carried out transpiration during the study. (10%)
C. The air temperature might have increased during the study. (10%)
D. The atmospheric pressure might have decreased during the study. (6%)

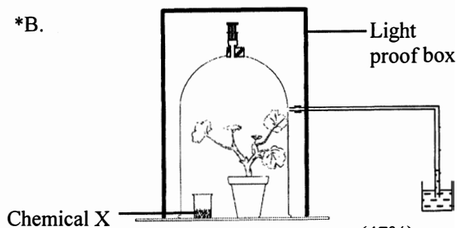
8. Which of the following set-ups can be used as a control for the above study to find out the actual rate of photosynthesis?

A.



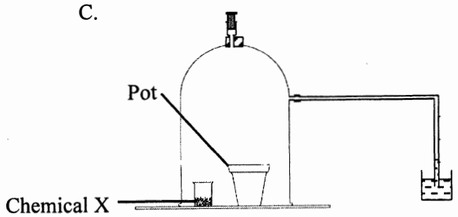
(21%)

*B.



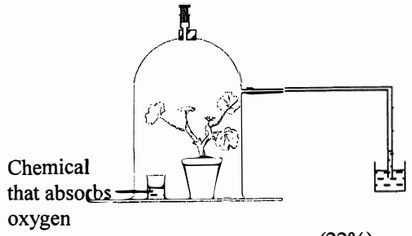
(47%)

C.



(10%)

D.



(22%)

Although 74% of the candidates were aware that the actual rate of photosynthesis was lower due to the respiration of the plant during the study, only half of the candidates chose the correct set-up for measuring the rate of respiration so that the actual rate of photosynthesis could be calculated. This shows that candidates' understanding of how to set up a control experiment was weak. The rest of the candidates chose set-ups with a modification which did not lead to meaningful quantitative measurements. It is worth noting that this coincides with observations from the School-based Assessment that the submitted reports were mostly on experiments that involved the collection and processing of qualitative data only. This inadequacy could be improved by more exposure to a wide variety of experimental activities that involve collection of quantitative data and the use of various control experiments in data treatment.

Section B (conventional questions)

This section included a wide variety of question types and assessed candidates' basic understanding of biological knowledge and concepts, the application of biological concepts to realistic and novel situations, the enquiry process of science and communication skills.

Markers considered the paper appropriate with regard to the level of difficulty, and balanced in terms of curriculum coverage.

The following table shows the general performance of candidates in individual questions:

Question Number	Performance in General
1	Well done
2	Fair
3	Satisfactory
4	Poor
5	Satisfactory
6	Poor
7	Good
8	Satisfactory
9	Good
10	Poor
11	Poor

1. Well answered. More than half of the candidates scored full marks for this question, showing that they were able to recall simple facts correctly. Some candidates mixed up NAD and NADP.

2. (a) Fair. Fewer than one-third of the candidates were able to label the two cells correctly, showing that candidates' ability to identify cell types from a photomicrograph was weak. Most candidates gave the wrong cell type or gave irrelevant answers such as plant cell type or organelles. Spelling mistakes were common.

(b) Fair. Most candidates missed the fact that the close-packing of epithelial cells formed a physical barrier to prevent the entry of bacteria. Although candidates mentioned the functions of the cilia and mucus, they failed to give clear descriptions. They often forgot to mention germs or bacteria in their answers. When describing the action of the cilia, they used words such as 'push' to describe the actions. Many of them just mentioned sweeping the dust and germs without giving their fates.

3. (a) Satisfactorily answered. Most candidates provided a proper explanation about why the new evidence disproved the early belief about cell division.

(b) Poorly answered. Most candidates elaborated on how the issue could be used to demonstrate that scientific knowledge is tentative and subject to change. This was probably because the first part of the question has already guided candidates to think about how new evidence could prove or disprove a belief. In the second part, only a few candidates were able to describe how the observations were guided by prior knowledge and understanding. This aspect of the nature of science was not tested in previous examinations. Candidates were not familiar with, or had some difficulty in understanding, the statement. The Curriculum Development Institute has published some teaching packages on the nature of science and it is recommended that teachers use these to promote understanding of the nature of science.

(c) Fair. Many candidates mixed up mitosis with meiosis. They thought that homologous chromosomes separated during mitosis. Some candidates did not distinguish between the terms "chromatin", "chromatid" and "chromosomes". Some candidates were not aware of the importance of the duplication of chromosomes during the interphase.

4. (a) Poorly answered. The quality of the drawing was poor. Many candidates did not know the requirements for low-power drawings and gave cellular details in their drawings. They failed to recognise different tissues shown in the photomicrograph and gave wrong labels. Many candidates labelled the pith as the cortex. They also failed to give a proper title for their drawings. Some candidates simply copied wording from the questions and used this as their title.

(b) Poorly answered. Most candidates did not pay attention to the proportions of different tissues in the stems. Instead of making deductions from the photomicrograph, many candidates recited their knowledge about support in plants. Only very few candidates made reference to the observations from the photomicrograph.

5. (a) Well answered. More than two-thirds of the candidates were able to state the type of succession involved. However, they were weak at explaining why it was a secondary succession. Some candidates misspelled it as 'second succession'.

(b) (i) Well answered. Most candidates gave the dominant community in the vegetation. However, they often missed or gave an inaccurate description of the time frame for each dominant community. Some candidates did not specify which vegetation they were referring to. Again, some candidates simply cited the respective percentage covers of the herbs and woody plants without pinpointing that the vegetation with the higher percentage was the dominant community.

(ii) Poorly answered. About one-third of candidates failed to score any marks in this question. They merely gave answers similar to (i) rather than providing a proper explanation. Some of them gave answers about how the soil changed with time to make it suitable for woody plants. These candidates regurgitated the suggested answer for the sample paper without paying attention to the fact that the context of this data set was completely different from that of the sample paper, which was actually a primary succession from bare rock to woodland. Candidates who were aware that the process involved secondary succession from herbs to woody plants failed to mention the presence of seeds or vegetative organs present in the soil. They were aware that there would be competition between herbs and woody plants but they failed to mention that woody plants would overshadow the herbs at a later stage.

6. The question was on an unfamiliar situation based on the some data supporting the evolution of dogs from wolves. Candidates were required to analyse the data sets and relate the data set to the change in the living habits of wolves during domestication. However, most candidates did not fully understand the situation. Instead of using the facts given in the text and data, they made speculations based on their own imagination. In handling questions with a specific context, candidates are advised to read through the question thoroughly to understand the information provided.

(a) Most candidates performed poorly in this question. They often repeated the data without citing a proper comparison. Even if they did compare, they forgot to relate this to the gene expression process when they tried to give their explanation. Also, the concept of multiple copies of genes was unfamiliar to them. They missed out the fact that each copy of gene A was capable of producing one amylase and they were not aware that the ability to produce more enzyme would lead to greater amylase activity.

(b) Poorly answered. Most candidates pointed out that the human food waste contained starch.

However, most of them wrongly thought that the wolves then mutated spontaneously to adapt to the diet, forcing themselves to produce amylase and digest the food waste. They were not aware that variations existed naturally, or how the human food waste served as a selection force. The more able candidates gave fluent and logical accounts of the events relating to the selection of multiple copies of gene A in dogs, but this was rarely seen.

(c) Poorly answered. This question could be regarded as a stand-alone question that requested an experimental design on how to compare the amylase activity of dogs and wolves. More than one design could be used to achieve the aim. However, most candidates failed to provide a clear and workable experiment. They often forgot to point out the source of amylase or gave an improper method; for example, they failed to mention the necessity of boiling in conducting Benedict's test, or they mixed the reaction mixture with an iodine solution instead of removing the mixture and adding it to the iodine solution at regular time intervals. Even if they correctly described the test for starch or amylase, they failed to state how the results could be used to address the aim. Quite a number suggested in vivo experiments, which were not feasible in this case.

7. (a) Well answered. More than half of the candidates were able to identify the two components of the cell membrane. Some candidates were careless when reading the question. They gave answers that were too specific, e.g. channel protein or hydrophilic head.

(b) (i) Well answered. The majority of candidates correctly stated that tube D contained the solution with the highest concentration of alcohol and were able to give a proper deduction from the results. However, some of them failed to explain that the damage to the cell membrane was due to dissolving of the membrane phospholipids in alcohol. Quite a number of candidates erroneously attributed the phenomenon to the differences in water potential and tried to explain their deduction using osmosis. Consequently, the explanation they offered in (ii) was incorrect.

(ii) Poorly answered. Many candidates did not realize that the leakage of pigment was a process of diffusion which involved random movement of the pigment molecules. As time went on, equilibrium would be reached, resulting in more or less the same amount of pigment in the bathing solution in all four test tubes.

8. The question was on an unfamiliar situation based on the strategy adopted by plants to increase the chances of cross-pollination. Candidates were expected to make use of their knowledge of the basic structures of the flowers and synthesize their answers by integrating information from the question. However, many candidates did not grasp the ideas about the different positioning of anthers and stigmas from the photographs, nor did they have a correct picture of how butterflies collect nectar from flowers. As a result, they had difficulty in answering (b).

(a) Well answered. This question was a simple and straightforward one assessing candidates' knowledge of the characteristics of insect-pollinated flowers. More than half of the candidates were able to give two observable features.

(b) (i) Poorly answered. Only one-third of the candidates suggested the correct position.

(ii) Fair. About half of the candidates were able to point out which type of flower would be more readily pollinated. Among these candidates, half of them were able to provide a proper explanation.

(iii) Poorly answered. Many candidates failed to link this up with the idea of increasing the chance of pollination between different types of primrose. Even if they did, they failed to elaborate on its importance to increase genetic variation in the next generation.

9. (a) Well answered. Most candidates were able to handle this simple and straightforward question.

(b) Good. More than half of the candidates were able to generalize a trend from the data.

(c) Poorly answered. Many candidates lost marks in this question because they failed to use comparative terms in their answers. Instead they simply repeated the percentages of the diseases. They failed to figure out the patterns of the lifestyles and match these with the number of deaths. Instead, they gave lengthy descriptions of how the disease might have developed. Candidates should pay attention to the requirements of the questions and address them accordingly. Recitation of irrelevant knowledge and facts often failed to score marks in questions involving data analysis. Some candidates mixed up 'vasoconstriction' with 'narrowing of blood vessels'. Some candidates did not point out that the processed meat might contain mutagens.

10. (a) Poorly answered. Many candidates misinterpreted the graph as showing the distribution of neurones on the retina rather than in the visual centre. Despite the fact that the question highlighted different types of photoreceptor cells, many candidates simply referred to cone cells and rod cells. They did not realize that there are three different types of cone cells for colour vision and that each type of cone cell would send nerve impulses to the visual centre, nor were they aware of the necessity of having more neurones to analyse the signals from different types of cone cells.

(b) Fair. Many candidates knew that the association centre was responsible for interpretation. However, they were not aware that the image seen will only make sense with reference to previously stored memory.

11. Poorly answered. Although the question was structured so that the main areas for discussion were hinted at: (1) how the diet could achieve the aim of losing weight and building muscles, and (2) the health problems associated with the nutritional needs and protein metabolism, many candidates did not follow the hints given to plan their essays. Instead, they gave discrete facts, poorly organized. In general, about one-third of candidates scored zero for communication skills.

In the part about losing weight, candidates showed a good understanding of the necessity of having greater energy expenditure than energy intake so as to mobilize food reserves. However, many candidates did not understand the term 'lean meat' in the question and failed to mention the reduced intake of fat in their answer. Candidates who attempted the English version of the paper had a higher mean mark than the candidates who attempted the Chinese version of the paper. Many candidates did not point out that the protein in lean meat would be digested and assimilated for building muscles.

Regarding the health problems, many candidates gave a long list of dietary deficiency diseases. Some candidates wrongly matched the named diseases with the vitamins or minerals in their answers. Nearly two-thirds of candidates scored full marks for diet-related problems. However, they often missed the part about the problems related to protein metabolism. Even if they did mention this, inaccurate descriptions were given, such as protein being directly deaminated in the liver. Some candidates mixed up amino acids with uric acid and wrongly thought that amino acids would cause gout in the joints.

Irrelevant materials were common. Some candidates gave lengthy descriptions of the diverse functions of proteins such as enzymes and hormones. Others listed the various functions of fat. All in all, candidates showed that they were capable of memorizing various facts on different topics; however, rarely could they select and link up related facts to produce a coherent and logical essay. Candidates are advised to read the essay question carefully and plan ahead some main ideas which should be included in the discussion. In this way, they can reduce the amount of irrelevant information and discrete facts in their essays, and hopefully score a higher mark for communication.

Paper 2

Paper 2 consisted of four sections. Section A contained questions on 'Human Physiology: Regulation and Control', Section B on 'Applied Ecology', Section C on 'Microorganisms and Humans' and Section D on 'Biotechnology'. Candidates were required to attempt all questions in two of the sections.

The following table shows the general performance of candidates and the popularity of each section:

Question Number	Popularity %	Performance in General
1(a)	93	Good
1(b)		Poor
2(a)	65	Satisfactory
2(b)		Satisfactory
3(a)	11	Poor
3(b)		Poor
4(a)	31	Poor
4(b)		Fair

Section A

1. (a) (i) Well answered. Nearly one-third of the candidates scored full marks for this question. Despite the fact that the question had highlighted that they should refer to the mechanisms involved in reabsorption, many candidates still thought that glucose was completely reabsorbed because it was essential to our body while urea was partly reabsorbed because it was metabolic waste. They showed little understanding of the function of the kidneys. Candidates should read the question carefully and think about the requirements.

(ii) (1) Satisfactorily answered. Nearly one-third of the candidates were able to give a clear and step-by-step description about how the absorption of the substances would lead to the absorption of most of the water. Some of them wrongly thought that the water potential of blood was higher. About one-third of the candidates scored zero marks because they gave a detailed description about the hormonal control of water reabsorption. This was irrelevant, as stated clearly in the question.

(2) Well answered. More than half of the candidates were able to state the hormone and its action. Some candidates failed to state clearly how the hormone worked. They simply stated that it regulated or controlled the reabsorption of water without mentioning it worked by increasing the permeability of the collecting duct to water.

(b) (i) Fair. About half of the candidates failed to point out the correct heart chamber. Despite the fact that the question highlighted that they should refer to the blood volume supplying the systemic circulation, quite a number of candidates still used both the left and right ventricles as their answer. Some wrongly answered the left atrium. Spelling mistakes were common.

(ii) Poorly answered. Many candidates did not fully understand the definition of venous return. They mixed up the effect on heart beat with venous return. Also, they tended to describe how the contractions of the heart resulted in pumping of blood to the aorta. However, they did not mention the effect of the strength of contractions, i.e. the magnitude of the contractions, on the volume of blood pumped out.

(iii) Poorly answered. When they read about doing exercises in the question, many candidates gave a lengthy description of the effect of exercise on the heart rate or the need for the heart to pump more blood out to supply oxygen, which was irrelevant to the question. Only a few candidates were aware that the venous return referred to the volume of blood entering the right atrium.

(iv) Poorly answered. Candidates had difficulty in comprehending the scenario provided in the question. They were not aware that a high running speed relied more on the supply of energy from anaerobic respiration while a low running speed relied more on aerobic respiration. Some candidates wrongly thought it was the heart muscle that would undergo anaerobic respiration when running at high speed. Some candidates held the misconception that the muscle needed extra energy and then switched to anaerobic respiration. In fact, it is the insufficient supply of oxygen for complete oxidation of glucose that leads to the conversion of pyruvate to lactic acid.

Section B

2. (a) (i) (1) Well answered. Most candidates were able to read the correct data from the graph. Some candidates forgot to give the unit and consequently scored zero.

(2) Well answered. Most candidates correctly chose pesticide B as their answer. However, about one-third of the candidates failed to quote their answer in (1) as an explanation to support their answers.

(ii) (1) Poorly answered. About half of the candidates were able to give at least one reason to account for the high toxicity of pesticide B. Many candidates failed to use comparative terms in their answer. Many candidates mixed up terms despite the fact that they have different meanings; for example, they used the word 'digested' instead of 'biodegradable' and 'egested' instead of 'excreted'.

(2) Satisfactorily answered. About half of the candidates were aware that the purpose of using a pesticide concentration of 5 μg L^{-1} was to keep the shrimps alive throughout the experiment.

(iii) Satisfactorily answered. Most candidates were able to state the difference in the concentration of pesticide A in the body tissues of the two types of fish. However, some candidates failed to give a clear explanation for the difference. Some of them did not refer to their trophic levels in their answer. They simply regurgitated the process of accumulation along the food chain. Candidates are advised that they should adjust their answer to fit the situation highlighted in the question.

(b) (i) Satisfactorily answered. Most candidates were able to state the correct location. However, they were not aware that the percentage cover of dead corals should also be considered when they made the deduction. They only focused on the percentage cover of live corals.

(ii) (1) Satisfactorily answered. About two-thirds of the candidates were able to state one human activity. However, their explanation was often incomplete. They failed to pinpoint that it was the inorganic nutrients that promoted the growth of seaweed. Some candidates misread the question and suggested human activities that led to the decline of corals instead.

(2) Poorly answered. They failed to elaborate on how the activity mentioned in (1) would affect the growth of corals. Some candidates suggested other human activities.

(iii) (1) Poorly answered. Most candidates were aware that the coral community could provide food and a breeding ground for other marine organisms. Some candidates mixed up 'habitat' with 'shelter'. Some candidates wrongly treated coral as a producer.

(2) Well answered. Some candidates misread the question, however, and thought that it referred to Ocean Park.

Section C

3. (a) (i) Poorly answered. Many candidates thought that *E. coli* was a pathogen and its presence in water would cause diseases directly. They did not know *E. coli* could be found in the faeces of vertebrates.

(ii) Well answered. Candidates generally knew that the larger the number of *E. coli* in water, the more polluted the water.

(iii) Poorly answered. Most candidates did not know the limitations of using organisms as a pollution indicator. Only a few candidates correctly stated two limitations.

(iv) (1) Poorly answered. Less than one-third of the candidates correctly stated the importance of using aseptic techniques.

(2) Poorly answered. Many candidates failed to give the correct method. Even if they did, they were not aware that an autoclave could kill the spores as well.

(b) (i) Poorly answered. Only some more able candidates correlated the environmental conditions with the growth of different microbes. Some candidates used the optimum temperature of enzymes to explain the production of different metabolites.

(ii) (1) Poorly answered. Candidates knew the method of pasteurization but only some of them related it to the importance of killing pre-existing microbes, which may affect the final taste of the cheese. Only a few of them pinpointed the purpose of adding certain microbes to produce the desired taste.

(2) Poorly answered. Many candidates pointed out that the punching of holes would facilitate fermentation. However, only some of them related it to the aerobic nature of the fungus. Only a few candidates related the blue colour of the cheese to the presence of a large amount of spores.

Section D

4. (a) (i) Fair. Candidates were usually able to point out that selective breeding involved sexual reproduction and there would be genetic variations in the offspring. However, some of them failed to highlight that the variations might lead to offspring with undesirable traits. Some candidates did not know that the offspring produced from cloning were identical. Some candidates did not point out the principles involved but gave lengthy descriptions of the two methods.

(ii) (1) Poorly answered. Candidates did not have a clear understanding of a gene pool. Although many candidates stated that only individuals with desirable traits were selected for breeding, only a few of them gave a correct description of the effect of this on the gene pool.

(2) Poorly answered. Many candidates were not aware that the genes inserted into transgenic animals could come from other species. As a result, they failed to point out that new genes were added to the genome of the transgenic animals. Many candidates simply regurgitated the general arguments about the consequences of producing transgenic animals without referring to the change in genetic constitution.

(b) (i) Well answered. More than half of the candidates were able to state the number of restriction sites found in the DNA fragments.

(ii) Fair. Many candidates simply regurgitated the principle of gel electrophoresis and how DNA fragments of different lengths could be separated. They failed to demonstrate their understanding by applying the situations given in the scenario, i.e. the cutting of DNA fragments containing the alleles would result in DNA fragments of different lengths for the normal alleles and mutated alleles respectively, and hence different patterns would result.

(iii) Poorly answered. Less than half of the candidates pinpointed the number of DNA bands

that would appear in the DNA fingerprint. They were not aware that the cut fragments at the two ends of the DNA were too short and thus they would move too fast in electrophoresis to stay in the gel. Only some candidates applied their knowledge about the genetic composition of a carrier and addressed the question using the idea of heterozygote to explain the bands observed.

(iv) Fair. Although more than half of the candidates stated the mutation was a result of a change in nucleotide sequence, only some of them were able to relate this to the production of a protein with a different amino acid sequence. The more able candidates further elaborated on the idea of how it would lead to production of haemoglobin with a different shape and its relation to the functioning of haemoglobin. Seldom did they refer to a change in the triplet code in their answers.

General comments and recommendations:

Generally, candidates did well in straightforward questions that required recall of biological knowledge. They were able to reproduce textbook materials or answers from previous exams. However, they lacked the ability to select relevant knowledge to address the requirements stated in the questions. As a result, when there were daily life scenarios that required an understanding of the situation and application of knowledge, they simply recited textbook materials on the relevant topics without adaptation. Candidates are advised to study the questions carefully, especially those with a context given, and paraphrase their textbook materials to address the issues concerned so as to avoid giving too much irrelevant material. Candidates' performance in questions related to scientific investigation was unsatisfactory. They were weak at identifying the cell types shown in a photomicrograph and failed to reproduce a proportional drawing that resembled the specimen. They should also pay attention to the sentence structures used in their answers, especially in dealing with questions that involve data analysis and comparisons. It is worth noting that many candidates simply repeated the data given and failed to point out the trends or patterns. Hence, they failed to relate or explain the trends or patterns with the relevant biological knowledge. Training in experimental design and analytic skills for data interpretation and deduction should be strengthened. This could be achieved by exposing candidates to a wider range of experiments, including both qualitative and quantitative ones, either as an SBA activity or a learning and teaching one. Emphasis should be put on the use of a control experiment, how to compare data and identify trends, and on the language used in comparison, making deductions and reporting. It is only through constructed learning activities that these essential skills can be imparted.

School-based Assessment

All school candidates sitting for HKDSE Biology Examination have to participate in School-based Assessment (SBA). A total of 16476 Biology students from 435 schools submitted their SBA marks this year. The schools were divided into 24 groups and the implementation of SBA by the teachers in each group was monitored by a District Coordinator (DC). The DCs were also responsible for reviewing the samples of students' work which were submitted.

Statistical moderation method was adopted to moderate the SBA scores submitted by schools. Outlier schools after statistical moderation were identified for further follow-up by the SBA Supervisor. 72.9% of schools fell into the 'within the expected range' category, while 11.7% of schools had marks higher than expected, and 15.4% of schools had marks lower than expected. However, among the schools with marks higher or lower than expected, the majority only deviated slightly from the expected range. These figures seem to indicate that majority of the teachers had a good understanding of the SBA requirements, and that the marking standards were appropriate, which is encouraging. However, a number of schools had moderated SBA scores which were significantly higher or lower than their raw scores, which indicates that the marking standards of the teachers concerned were either too strict or lenient as judged by the supervisor and the DCs. Teachers should pay due attention to this discrepancy and adjust their marking standards in the future.

Some schools were visited by the DCs to gather first-hand information on the implementation on the Scheme in schools. According to the feedback of teachers and the DC's reports, the assessment process was smooth and effective in general. SBA marks were submitted on time and all requirements were met. The major observations on this year's SBA are:

Many of the investigative reports included the basic components of a report as stipulated in the handbook, such as aim, procedure, identification of variables, data table, discussions on the errors, suggestion of possible improvements, and conclusion. This reflected that the teachers and students were aware of the requirements of a scientific investigation and the way it is reported. This was also attributed to the lab worksheets set by the teacher or provided in textbooks, in which students are given guidance to work out the components one by one.

However, some worksheets, instead of giving clues or prompts, were constructed in the format of questions and answers, making the lab report fragmented, with short and simple answers. For instance, in the design of the experiment, only the independent, dependent and control variables were identified without any explanation and elaboration. There were particular problems with the discussion section, where the reliability of data, problems in design, measurement errors, and improvements should be discussed coherently in an argumentative manner before a proper conclusion is drawn. Therefore, teachers are advised not to require their students to work out a lab report through answering short questions, but rather to give students guidance on writing a full report on their own.

In the results section, the data were usually shown properly with tables, but the plotting of graphs was unsatisfactory. First of all, students should be able to decide whether a graph was needed in addition to data table, for instance, to indicate an estimate of values between data points or show the trend of the data. Secondly, students should choose appropriate graphs to present the data in accordance with the purpose. For instance, a bar graph should be used when the independent variable is categorical, such as gender. Also, when the estimation of values is to be made, a best fit line should be drawn instead of connecting the plots by short straight lines.

As in previous past years, the number and types of investigations were limited. Teachers are advised to have their students investigate problems that are not only genuine and relevant to everyday life, but also able to facilitate the development of scientific reasoning and the understanding of biological concepts. The integration of lab work with classroom teaching and learning is of paramount importance.

Students should complete the assessment tasks honestly and responsibly in accordance with the stipulated requirements. They will be subject to severe penalties for proven malpractice, such as plagiarizing others' work. The HKDSE Examination Regulations stipulate that a candidate may be liable to disqualification from part or the whole of the examination, or suffer a mark penalty for breaching the regulations. Students can refer to the information leaflet HKDSE Examination- Information on School-based Assessment (http://www.hkeaa.edu.hk/DocLibrary/Media/Leaflets/SBA_pamphlet_E_web.pdf) for guidance on how to properly acknowledge sources of information quoted in their work.