CARIBBEAN EXAMINATIONS COUNCIL

REPORT ON CANDIDATES' WORK IN THE SECONDARY EDUCATION CERTIFICATE EXAMINATION

MAY/JUNE 2010

INTEGRATED SCIENCE (SINGLE AWARD) GENERAL PROFICIENCY

GENERAL COMMENTS

The CSEC examination in Integrated Science (Single Award) was offered at the General Proficiency Level in June 2010. The examination consisted of the following papers: Paper 01 – Multiple Choice; Paper 02 – Short-Response Questions; Paper 03 – School-Based Assessment and Paper 03/2 – Practical Paper - which was taken by private candidates.

The number of candidates entering for this examination was approximately 23,000. There was an increase in the number of candidates entered for the examination when compared with 2009. The overall performance of candidates in the 2010 examination was consistent with performance in 2009.

The CSEC Integrated Science continues to be well received across the Caribbean, as indicated by its increasing population over the years. This subject therefore contributes, as intended, to meeting the needs of the secondary level schools in the area of science education.

The CSEC Integrated Science syllabus is designed to "*allow students to work individually and cooperatively, utilising theoretical concepts of the course in interactive and practical activities"*.

(CXC Integrated Science Syllabus, 2009; p.1)

Within the school system, a variety of strategies could be explored for optimizing the benefits that may be derived from implementing the CSEC Integrated Science syllabus. For example, levels of collaboration among teachers who are often subject specialists in the areas of Biology, Chemistry and/or Physics could facilitate team planning and/or teaching and encourage adequate integration among topics often associated with the single subjects. Students' performance on topics usually associated with Physics is likely to improve if this strategy is employed. Improved syllabus coverage in the less popular areas of the syllabus could be an objective while this and other strategies are considered.

DETAILED COMMENTS

Paper 01 – Multiple Choice

Paper 01 consisted of 60 multiple choice items. The mean score earned at the General Proficiency Level increased by approximately 2.8 from 43.2 in 2009 to 46.0 in 2010.

Paper 02 – Short-Response Questions

Paper 02 consisted of six short-answer, structured questions. The maximum mark for each question was 15 and the maximum mark for the paper was 90. The mean score earned on this paper was approximately 62.6.

Question 1

This question tested candidates' understanding of the structure and function of the circulatory system of humans and how substances move in plants. It also tested candidates' understanding and ability to apply the concept of 'centre of gravity'.

In general, this question was fairly well answered with many candidates scoring most of the available marks.

Part (a) required candidates to give a reason for the transport system in a child and a plant. Some candidates adequately indicated that the system was responsible for the movement of substances (water, minerals, food, oxygen, etc) around the plant or the child. However, some candidates gave broad, ambiguous answers such as 'to stay alive or to grow' which were inadequate because the specific reason for the transport system was not indicated.

For Part (b), candidates were asked to name the processes that allow water to move in and out of the plant. Many candidates correctly named osmosis (at Z) or transpiration (at Y). However, very few indicated whether or not the process identified was occurring at Y or Z. Frequent incorrect answers included photosynthesis, transportation, xylem and phloem which are parts and not processes.

In Part (c), candidates were required to use arrows to show how (i) blood is circulated through a child's body and (ii) water moves into and out of a plant.

Transport in the child: A good response for the circulation of blood in the child used three arrows to show movement/complete circulation from the heart to legs and back to the heart, and from the head to the heart and back. Many candidates provided this correct response. Some common incomplete responses included the arrows drawn from the head to the heart and from the heart to legs but none drawn showing the blood returning to the heart.

Transport in the plant: A good response for the movement of water into and out of a plant displayed arrows moving from the soil to the root, then up the stem and the third arrow drawn through the leaf and out. Common erroneous responses showed arrows (representing the water) not starting from the soil and then entering the root, but starting from the air or the base of the stem, omitting the root.

For Part (d), for which the candidates were required to name the organ that pumps blood through the human body, some responses correctly indicated the heart; a few students inappropriately indicated the circulatory system as the answer; while some responses also indicated incorrect organs such as the lungs and kidneys.

For Part (e), candidates were required to put a point G on the diagram of the child to show the centre of gravity of the child. An acceptable answer showed 'G' in the abdomen of the child. Some candidates incorrectly showed 'G' outside of the child's body or in the wrong position of the body.

For Part (f), some candidates were able, as required, to draw a vertical arrow from Point G pointing downward to show the direction of the centre of gravity.

For Part (g), candidates were required to state two features of the circulatory system that allow blood to move from the child's leg to the heart. Good responses gave the features as (1) the cardiac muscle of the heart (that pump the blood around the body) and (2) the valves of the veins (which prevented the flow of blood backwards and ensured that the blood returned to the heart).

Recommendations

1. Students could be engaged in more activities in which they diagrammatically represent and interpret the movement of substances throughout living things to the levels of completeness required by the relevant syllabus objectives.

2. To develop their ability to present drawings or graphical representations, especially related to forces and motion, students could be guided through instruction in using points and arrows appropriately.

Question 2

This question tested candidates' understanding and ability to apply their knowledge of the conditions that encourage the breeding of household pests and the need for community hygiene. It also tested their understanding of water purification. In general, the responses to this question were very good with many candidates scoring full marks. There were very few non-responses.

For Part (a), a few candidates incorrectly named 'pets' (e.g. dogs and cats) instead of 'pests'. The acceptable responses for pests included houseflies, cockroaches and rats.

For Part (b), for which candidates were required to describe how the named pest affect humans, the acceptable responses indicated that humans may get diseases caused by the bacteria or virus which may be spread by the pests. Other acceptable responses included reference to 'damage of household items and furniture'. Many of the candidates' responses — such as 'spreading sickness or disease' by pests — were vague and required the show of a more scientific understanding of how the pathogens are carried by the pests.

For Part (c), most candidates provided acceptable responses for two methods of controlling household pests. Acceptable responses were:

- Removing sources of food; proper storage of food
- Using poison (e.g. pesticide or insecticide)
- Using traps (e.g. rat traps)
- Cleaning and disposal of garbage
- Biological methods (e.g. using cats to kill rats)

Part (d) which required the identification of an object, from Figure 4, which may encourage breeding of mosquitoes, was also well done by many candidates. The expected responses included tyres, cans and jars.

For Part (e), ways of reducing the incidence of dengue fever were well known by many candidates who provided acceptable responses such as getting rid of mosquitoes by removing objects which can collect water, for example, tyres, and empty cans; spraying; covering open empty objects, using methods of controlling mosquito breeding.

For Part (f), which required candidates to name two other diseases spread by mosquitoes, 'Malaria' was the most popular response. Other acceptable responses included *Yellow Fever, West Nile Virus, Dog heartworm disease, Encephalitis and Lymphatic filariasis.*

In Part (g), in which candidates were required to name two impurities that may be present in rainwater collected from the roof in containers, many responses were good. Acceptable responses included '*animal droppings/faeces, dust, leaves and dead insects. Mosquito larvae and 'bacteria'* were also acceptable.

Part (h) required candidates to suggest two ways that can make collected rainwater safe for drinking. Most candidates were able to supply the expected responses 'boiling' and 'adding bleach/chlorine'. The most appropriate responses indicated filtering (straining) then boiling. Distillation and also adding a purifying agent such as bleach were acceptable. Filtration was not acceptable because, by itself, that process would not make the impure water safe for drinking.

Recommendations

1. In addressing the relevant syllabus objectives, greater emphasis could be given to understanding the concept 'pests' in order to prevent confusion between the terms *pets* or *parasites*. The role of pests in spreading disease under unsanitary conditions must be considered in relation to the spread of pathogenic microorganisms.

2. In general, as required through the relevant syllabus objective, in discussing conditions that encourage the breeding and control of household pests and parasites, it is important that clear explanations are considered for the role of these organisms, so that the use of selected methods can be justified.

3. A review of current prevalent diseases in the Caribbean should be considered in an attempt to elicit and correct ideas of candidates that may be unscientific though consistent with some erroneous cultural views.

Question 3

This question tested candidates' understanding of the importance of diet and exercise and their ability to use their knowledge to analyse recommendations and explain related observations. This question was attempted by most of the candidates and some responses were satisfactory.

For Part (a) (i), in which candidates were required to indicate the effect of weightlifting on the muscles of the body, many candidates stated acceptable responses. The expected response was "*increase in muscle mass or strength*".

Increase in fitness (for overall body functioning) and efficiency of circulation or breathing were acceptable responses for suggesting one benefit of aerobics and running that cannot be gained by weight lifting.

For Part (b) (i), the candidates were required to indicate two food groups associated with lean meats, peas, rice and sweet potatoes. This part was also generally well done with candidates suggesting two of the following acceptable responses: *staples, food from animals and/or legumes, carbohydrates and proteins*.

For Part (b) (ii), many candidates indicated correctly the function of each of the named food groups; for example, "*protein needed for growth or muscle building*", and "*carbohydrates are needed for energy*."

For Part (c) (i), many candidates indicated the appropriate responses that showed an understanding that in running, more oxygen was needed with increased energy demand. For Part (ii), many candidates indicated the

appropriate responses that showed an understanding that in exercising, the heart beats faster as there is need for more oxygen and nutrients with the increased energy demand.

For (d) (i), in which candidates were to name one physical factor other than fitness, that a father must consider when joining his daughter in doing exercises, many responses indicated the expected responses of *age, sex (gender) or diet*. The expected reason was that the factor named, affects the persons health and ability to exercise.

Part d (ii) was generally well done. An acceptable response indicated that fat was used up in the body because of the increased activities, increased energy demand/need and that fat is converted to carbohydrate and used in providing energy.

For Part (e), most candidates responded correctly by indicating three of the following possible negative effects of steroids on (Sophia's body): *High blood pressure, heart disease, liver damage, cancer, stroke and blood clots, digestive problems, headaches, joint pains, female developing male characteristics, nervous problems, increased heart rate, kidney failure and possible harm to foetus during pregnancy.*

Recommendations

1. Students need to be able to differentiate between positive and negative effects. Discussions about effects can therefore involve identifying disadvantages of the features when considering negative effects and advantages of other features when considering positive effects. Also, identifying what makes a situation negative or positive can be explored with students.

2. Some unscientific explanations are sometimes provided by candidates, for example, "fat was turned into muscle" and fat was "melted" during exercise and changed into sweat. In discussions with students and through the construction of relevant probing questions, attempts can be made to elicit such ideas and the appropriate explanations developed. Assignments involving Internet and textbook searches on these ideas could be prepared and the findings discussed within the context of the relevant syllabus requirements.

Question 4

This question tested candidates' understanding of the concept 'stable equilibrium' and the structure and function of parts of the nervous system. It required comprehension of how energy is obtained from food, the parts of the eye and an understanding and application of corrective measures for an identifiable eye defect based on information provided.

In general, this question was not very well done by most candidates. For Part (a), Sueling (lying flat when compared to the other persons upright or sitting) was successfully identified by most of the candidates as having the most stable equilibrium. Some candidates provided correct reasons, indicating that Sueling's whole body was spread out or lying on the floor and had the lowest centre of gravity.

Part (b) examined candidates' ability to relate stimuli with the appropriate sensory organ and major coordinating role during rehearsal for a concert. Few candidates provided the expected responses to indicate that in (i) light is the stimulus for the eye; (ii) relative to the stimulus sound, the major coordinating role of the

ear was for balancing to avoid falling and (iii) relative to movement, the sense organ is the ear (with the semicircular canals of the inner ear) which assists in balancing to avoid falling.

Many candidates did not indicate that light stimulates the eye; sight (instead of light) was often the inadequate response for the stimulus. The ear detects sound enabling movement to a beat/rhythm. Many candidates did not relate their responses to the rehearsal described in the question but made general statements.

For Part (c), candidates were expected to demonstrate their understanding that energy is obtained from food, for example, carbohydrates or fats, and that glucose is used in the process of respiration to provide energy for movement.

For Part (d), some candidates provided correct responses indicating L as lens and M as retina in Figure 6.

Part (e) was generally well done. Most candidates correctly stated the condition for the paper being read from arm's length, as farsightedness or hypermetropia. Other acceptable responses indicated that *the image formed behind the retina; the eyeball was too short; or the lens was too thin/flat.* For (ii), many correctly identified convex lens as the solution. Some candidates incorrectly indicated short-sightedness and also identified the wrong corrective lens, that is, concave and diverging, instead of convex or converging lens.

Many of the responses inadequately/vaguely identified the corrective measure as using medicated glasses or glasses prescribed by a doctor. Some candidates also stated that the condition may be corrected with the use of eye-drops.

Part (f) was fairly well done. Many candidates correctly responded to this part of the question, indicating a precaution that can be taken to prevent damage to the eyes when reading late into the night. Correct responses were:

- The use of brighter or more light
- Resting the eye (e.g. at intervals during reading period)
- Not using too much light to damage the eye
- The use of fluorescent light
- The use of desk/reading lamps
- Consuming foods high in Vitamin A

Recommendations

1. More instructional emphasis appears to be necessary regarding the application of the concept of centre of gravity in everyday life situations. Examples involving a wide variety of objects and situations should be utilized. Considering objects of different heights and widths, cases can be analysed in terms of the position of the centre of gravity (extent to which it is raised from the ground), the base area of the objects compared to their height and position of the centre of gravity.

2. Structured questions and related hands-on experiences should be used to prepare candidates to apply their knowledge in this area to everyday life situations.

Question 5

This question tested candidates' ability to read an electricity meter and calculate the cost of electricity from information provided. It also tested their knowledge of energy conservation strategies, parts of an electrical circuit and energy changes in an electrical appliance.

Part (a) (i) was relatively well done. Many candidates correctly indicated 'measuring the quantity of electricity used' as the function of the electricity meter.

For (a) (ii), while some candidates indicated the correct reading of 23,209 kWh, others provided a variety of incorrect subtraction calculations. For (a) (iii), in calculating the amount of electricity used for the month, many candidates incorrectly added, instead of subtracting, the two readings for June 1st and June 30th. The unit (kWh) was left out in many instances.

For (a) (iv), in calculating the cost of electricity for the month, many candidates correctly used the value from (iii) (the amount of electricity for June) and multiplied it by 70 cents. Some candidates made errors in the basic multiplication of the correct values.

For Part (b) (i), some candidates supplied the correct answers of 21.6 kWh for the refrigerator and 3 (hours) associated with the electric kettle. In (b) (ii), many candidates correctly provided three of the following (or other acceptable) measures which family members could implement to reduce energy consumption:

- Using energy efficient appliances
- Using appliances only when necessary
- Keeping refrigerator door closed when not in use
- Turning off electrical appliances (e.g. television) when not in use
- Switching off lights when not in use

For (b) (iii), few candidates displayed the required ability to determine which appliance consumed more or less energy and which appliance reduced/increased the electricity bill based on the duration it was used.

For Part (c), in distinguishing between a 'switch' and a 'fuse', many candidates stated the function of a switch. However, many were unable to demonstrate clear understanding of the function of a fuse. The expected response was "*the fuse is a protective device (protecting against voltage/current overload*; this is not the designed role of the switch, which is used for simply turning on or off an appliance."

There were many incorrect responses with regard to the purpose of a fuse; for example, the fuse was sometimes inappropriately equated to a bulb, resistor, transformer or capacitor.

Part (d), which required candidates to state the energy changes that take place when an electric oven is used in a solar powered home, was generally not well done. Few candidates had the correct responses of solar energy to electric energy to heat energy. Many candidates inappropriately indicated (based on their responses) that solar energy was equivalent to light energy, heat energy or nuclear energy.

Recommendations

1. Students need to be exposed to the practical areas of topics as much as possible; emphasis should be placed on the importance and functions of components as required in the syllabus. Attention should be given to providing examples of simple circuits, switches and fuses (exercising all safety precautions).

2. The making of simple solar cells, solar panels and solar cookers are suggested practical activities.

Question 6

This question tested candidates' understanding of the concepts of 'linear momentum', 'gravitational potential energy' and 'energy' in general. It required the calculation of momentum associated with colliding bodies as well as the identification of the type of energy present before, during and after the collision.

For Part (a), many candidates appeared not to have knowledge of the concept of the conservation of 'linear momentum'. Few candidates indicated the expected response that *the concept of the conservation of 'linear momentum' refers to the fact that when two objects collide, the total momentum before the collision is equal to the total momentum after the collision*.

Part (b) (i) was attempted by some candidates. Acceptable responses were that the truck moved backwards (or in the direction of the trolley); both the truck and trolley would move together in the direction of the trolley.

Parts (ii) and (iii) were well done by a few candidates who provided the response of 40 kg m/s for (ii). For (iii), acceptable responses included: "the truck and trolley would come to a stop upon collision, or they could move away from each other".

Part (c) (i) was not well done. The expected response in defining energy was "the *capacity* or *ability* to do *work*". Some candidates equated energy to respiration. Several possible misconceptions were reflected through incorrect statements that energy is a "substance, force, power, strength and electricity". Acceptable answers for the unit of energy were '*Joules and Kilojoules*', *Kilowatt hour or their corresponding symbols: J, kJ, and kWh* for (ii). Many candidates incorrectly gave units and symbols of voltage, current, resistance and force, showing lack of or incomplete understanding of these terms.

Part (d) tested candidates' knowledge and understanding of various forms of energy associated with the trolley collision. Candidates needed to be able to state the form of energy as it related to a trolley colliding with a stationary toy truck (i) before, (ii) during and (iii) after the collision. Few candidates gave adequate responses to indicate: (i) kinetic energy in trolley or potential energy in truck, (ii) potential, sound or heat, (iii) kinetic (or heat).

For Part (e), in explaining where the gravitational potential energy of the toy truck came from, very few candidates fully indicated that gravitational potential energy is the energy possessed by an object due to (or because of) its position in a gravitational field.

Many candidates apparently understood the relationship between gravitational potential energy and gravity. However, they did not indicate that this energy depended on the *position* of the object in the gravitational field.

Recommendations

Students need to be more exposed to this area of the syllabus which seeks to develop their appreciation for the importance of energy in everyday life as well as a general understanding of the principles of conservation of mass energy.

Students need to be guided through activities using toy moving and stationary objects to model vehicular or other forms of collisions. The concrete experiences can be converted (or translated) to relevant linear momentum problems requiring the calculation (with use of the appropriate formula where necessary) and descriptions of the movements in terms of the momentum of the objects before, after and during collisions.

1. *Using Knowledge*
   Students appear to require more practice in applying scientific knowledge to everyday life situations. They need to have practice through relevant structured questions and related hands-on experiences and practical examples through scenarios and cases, to adequately prepare them to apply their knowledge in everyday life situations.

2. *Improving Language Skills: Grammar and Spelling*
   Candidates need to be reminded about the need for proper grammar, sentence construction and spelling. Marks are more accessible when answers are communicated effectively. Teachers can incorporate these elements as part of their evaluation of student's work. Occasional or regular spelling quizzes or games with scientific terms may also help.

   Structured questions requiring the use of a variety of sources (online and texts) could assist students in identifying relevant myths (for correction through class discussions) compared with the scientific facts from authentic sources. This may be necessary given the wide scope of information accessible to students in this information age.

3. *Understanding and Using Scientific Terms*
   The use of scientific terms (to the level guided by the syllabus should be encouraged). Terms such as energy, force, power, strength and electricity should be appropriately used. In the case of diseases, the use of scientific terms should be encouraged and preferably used when responding to questions.

4. *Distinguishing between Terms*
   Students need more practice in distinguishing between related and sometimes unrelated concepts and should be guided in expressing differences in terms of parallel points to improve completeness of responses. There is a need to guide students through appropriate activities to distinguish between the following listed pairs of terms.

   - Stable and unstable equilibrium
   - Sight and light
   - Far-sightedness and short-sightedness
   - Retina and lens
   - Fuse and switch
   - Solar energy and light
   - Energy and respiration
   - Energy and power
   - Force and power
   - Conservation of energy and conservation of linear momentum

- Transport of energy and transfer of energy
- Pets and pests
- Pests and parasites

5. *Improving Mathematical Skills.*
   Students require practice in using formulae for working out values. Accuracy and use of appropriate units should be encouraged.

Report on Paper 03/2 – Alternative to School-Based Assessment

This paper consisted of two questions which tested all five practical (SBA) skills. Most candidates attempted both questions and the majority followed the instructions provided to perform the required activities.

Question 1 provided candidates with a bean and okra, and required that they measure and draw them, as well as perform food tests.

Question 2 required the use of a small 100g mass and wood set up with different surfaces and slopes. Candidates were required to follow the instructions provided and to use their results to calculate frictional force. This question also required that candidates plot a graph of frictional force against height for calculated values of frictional force corresponding to different heights.

Manipulation and Measurement

- The basic skills of manipulation and measurement evident in candidates' responses were not well developed in some instances. The term 'diameter' might not have been adequately known by some candidates. For Question 2, many candidates appeared to have measured the required heights appropriately.

Observation Reporting and Recording (ORR)

- The skill of Observation Reporting and Recording (ORR**)** was fairly well developed. Most canididates were able to get at least half of the marks with regard to consistency in decimal points.
- Very few canididates were able to write a suitable title in both questions.
- For Table 2, used to record the food test results, the observation skills reflected by the candidates were satisfactory.

Analysis and Interpretation

- For constructing the graph of frictional force against height in Question 2, some canditates appeared not to have known
  - which variable goes on which axis
  - how to label the graph and axes, inclusive of units
- Many candidates were able to derive accurate information from the graph.

Drawing Skills

- This skill was fairly well developed; many candidates scored most of the available marks for questions 1a and 2c.

Analysis and Interpretation

- Relative to Question 1(e), for man candidates, analysis and interpretation skills appeared to be under-developed. Most candidates were able to classify the ochro as a fruit and the bean as a seed, however, they did not justify their answers.
- Many candidates received most of the marks for the calculations in Question 2.

Planning & Designing

This skill needed to be further developed by many of the candidates especially in regard to the area of writing a suitable hypoyhesis as in question (1) (g) and variables as in question (2) (e). Few candidates appeared to be knowledgeable about what makes a good hypothesis.

Recommendations

- Students appear to need more guidance in determining what information a proper title should provide. This may require engaging them in activities where they are required to interpret information from tables, design tables, and construct as well as provide headings for tables. Discussions of the titles and their suitability for the associated columns and rows of data could also be helpful.

- More practice in drawing biological and non-biological drawings, bearing in mind the critera for good drawings, should help to develop candidates' drawing skills.

- It is important that the syllabus be reviewed by teachers and candidates and that definitions for the required skills for development in candidates be used as a guide for instruction.

- In general, candidates can benefit from engagement in more relevant practical work as guided by the syllabus (in terms of content, skills and attitude development), observing all safety precautions.

- Candidates can also benefit from more instructional experiences in providing appropriate labels for axes, plotting points and connecting them appropriately.

Paper 03/1 – School-Based Assessment

Overall performance

Overall performance at the General Proficiency Level was satisfactory. However, there is a need for candidates to be guided in developing the skills of Analysis and Interpretation and Planning and Design.

- Generally, notebooks and mark schemes were submitted. In most cases, student instruction sheets were not submitted.

- Some of the activities represented in the laboratory notebooks were typical textbook activities which did not engage students in developing sufficiently, their inquiry skills.

- Many centres provided laboratory notebooks that were not very neat, well organized and easy to mark. Many SBAs needed to be tidier and more organized. A few centres provided some acceptable books. Many centres provided laboratory notebooks that needed to include a table of contents with the date, page number and the skills assessed for each assignment.

- Generally, candidates' spelling required much improvement.

- Many books did not reflect the provision of appropriate feedback to candidates. It is likely that this accounted for the fact that there was no noticeable improvement over the assessment period for some candidates.

- In some cases, the scores provided in the laboratory notebooks for some skills, appeared too lenient.

Comments on Drawing, Planning and Design, and Analysis and Interpretation

Drawings (D)

Key positive points

- The majority of drawings were of adequate size.
- The label lines, in most cases, touched the correct parts of the drawings.
- The majority of drawings were two-dimensional.

Key negative points

- There is a need for the drawing of more biological specimens.
- In a few cases, arrow heads were attached to label lines.
- Titles in many cases were inappropriately written and positioned.
- Many of the candidates did not demonstrate an adequate understanding of how to calculate magnification.

Recommendations

- All titles should be placed at the bottom of each drawing and there should be a statement informing the reader of what the drawing represents. In addition, the view and accurate magnification should be clearly identified within the title.

- The use of arrow heads should be avoided. In addition, a ruler should be used to draw all label lines and they should be parallel to each other. Label lines on the same side of the drawing should stop at the same point.

- The labels, written in print (script), should be started at the end of the label line. They should never be printed on the label line. The labels should either be upper **or** lower case but **never** a combination of both.

- The lines of the drawings should always be clear, distinct and continuous; that is, students should avoid shading, double lines and sketching at all times.

- Drawing should be of specimens. Diagrams and natural cycles are not to be presented as SBA drawings.

Planning and Design (PD)

Key positive points

- The assignments chosen for planning and design reflected a clear understanding of what is acceptable for such assignments.

- Most Planning and Design assignments were generally workable.

- Most assignments assessed in this category illustrated a clear role of the control.

Key negative points

- Too many assignments were taken from textbooks without any modifications.
- Some of the assignments were not marked.

Recommendations

- The hypothesis should be clearly stated and be a specific statement or prediction which is different from the aim of the experiment. Also, it should be: (a) suitable, that is, an experiment can be preformed to test the hypothesis; and (b) manageable, that is, it should be realistic.

- The procedure of the experiment should be clearly written and demonstrate scientific skills which can be used to prove or disprove the hypothesis.

- In regard to attention to detail, candidates should be precise and concise. For example, there should be specific quantities assigned to each type of measurement used such as volume, temperature, length, mass, etc.

- The steps of the procedure should be in logical sequence.

- Format of expected data/results should be clearly presented. Candidates are not expected to carry out the experiment; however, the way in which they intend to present their results should be written clearly, for example; tables can be used with the appropriate headings and title, prose can also be used to identify the expected data.

- Precautions refer to the steps used to ensure accuracy and safety, which do not affect the experiment. They should also be clearly identified.

- In instances where the candidate actually carried out the activity, they should indicate if the entire procedure or measurements of the experiment were repeated to verify consistency and accuracy.

- There should also be a control and it should always be clearly identified.

Analysis and Interpretation (AI)

In general, there has been a decline in the standards of the practicals assessed for Analysis and Interpretation. Teachers must be made more aware of the criteria used to assess this particular skill. Another area of concern is the use of guided questions as opposed to encouraging students to evaluate the data obtained. Many of the guided questions were inappropriate for the AI skill since they only required definitions and were often not related to the aim of the experiment.

Recommendations

- Laboratory exercises chosen for assessment were too simple, for example 'testing milk for protein'.

- Laboratory exercises must lend themselves to the identification of trends, patterns and relationships.

- Inferences must be linked to the results/observations.

- Evaluations should not be general statements. Conclusions need to be linked to the aim of the lab stated and the data obtained.

- Calculations shown must include formulae and units.

- Questions from the textbook should not be used as AI laboratory exercises.

- Laboratory exercises must be carried out and the data generated, analysed and interpreted.