REPORT ON CANDIDATES’ WORK IN THE
SECONDARY EDUCATION CERTIFICATE EXAMINATION

JANUARY 2010

PHYSICS
GENERAL PROFICIENCY EXAMINATION
GENERAL COMMENTS

This year 1667 candidates registered for the examination. This represented a 94 per cent increase in the number of registered candidates compared with 860 in January 2008.

This trend is encouraging as it is important for the region to have a sufficient number of qualified Physics graduates to cater for the increasing thrust in Science and Technology which is the driver of present and future development of the Caribbean.

Once again, candidates showed deficiency in the use of mathematical skills in the areas of scientific notation, the solving of equations and simple geometry. More emphasis must be placed on using mathematical skills in studying physics. Approximately 38.7 per cent of the candidates obtained acceptable grades — Grades I–III. There was a notable decline in the performance of candidates in Profile 3, Experimental Skills.

Paper 01 – Multiple Choice

The performance in this year’s multiple choice paper was below that of January 2009. This year, the mean score was 28.35 out of 60 with a standard deviation of 10.63.

Paper 02 – Structured/Essay Type Questions

This paper consisted of one data analysis, two structured questions and three essay type questions.

Section A

Question 1

This question tested candidates’ ability to investigate Charles’ Law. It also involved completing a table by transforming T/˚C to T/K, drawing and interpreting a graph and solving a problem based on Charles’ law.

The overall performance revealed that 40 per cent of the candidates received a score of 13 (52 per cent) or more out of a possible 25 marks.

Areas of Good Performance

Two main areas of good performance were in (a) plotting the graph and (b) determining the slope of the graph.

In plotting the graph, core requirements included labels with units, correct axes orientation, correct scales, and best straight line or curve.

In determining the slope, a large triangle was needed, correct read offs and calculations to significant figures were also required. Most candidates were able to convert to the Kelvin scale.

Area of Weak Performance

In Part (g), the problem involved converting temperature. Many candidates failed to convert correctly. Writing correct units was another weak area.
General Comments and Recommendations

(a) Candidates should use the graph page to its maximum.
(b) Candidates should use (.) or x when plotting points.
(c) Candidates should be given adequate practice in drawing and analysing graphs.

Question 2

This question tested candidates’ knowledge of some basic concepts, quantities, their formulae and units. One of the quantities was momentum which was further explored via the law of conservation of linear momentum and two practical applications. One situation involved a societal concern related to road accidents.

Performance on this question was not good. Only 20 per cent of the candidates scored more than 7 marks out of a total of 15 marks.

Areas of Good Performance

Part (a) of the question was well done. This section required candidates to identify a quantity, formula or unit when given only one of either and to state the law of conversation of linear momentum.

Areas of Weak Performances

Parts (b) and (c) posed difficulties for candidates. Many of them used energy transfer and momentum to explain the question on the ‘big crash on the highway’. Instead, change of momentum should be the focus.

General Comments and Recommendations

(a) Teachers should pay attention to clarifying the differences between moments and momentum.
(b) Attention should be placed on fundamental quantities and units.

Question 3

This question tested candidates’ knowledge of sound waves and light. It explored waves, in particular, the definition and identification of wave parameters. The problem posed was based on the popular steelpan. A few candidates scored the full 15 marks but the vast majority scored less than a quarter of the full marks.

Areas of Good Performance

In Part (b) (i), the identification of a wavelength was a clear area of good performance.

Areas of Weak Performance

(a) Identification of amplitude.
(b) Drawing of wave trains.
(c) Converting SI units and working with formulas relating to waves.
(d) Calculating the refractive index.
General Comments and Recommendations

Candidates must be exposed to basic wave definitions and the drawing of waves.

Section B

Question 4

This question in part totalled candidates’ knowledge of Thermal Physics which related to real life situations in a school setting. It related to a vacuum flask. The second part concerned the solar water system, very relevant in this emerging age of ‘green technology’.

This question was poorly done with only 10 per cent of the candidates scoring more than 7 of the 15 available marks.

Areas of Good Performance

Part (b) (ii) which required the calculation of energy per day, given the percentage of heat energy emitted by a solar collector.

Part (b) (iv) which required the calculation of the mass of water that can be heated from 25°C to 55°C during the day.

Areas of Weak Performance

Part (b) (i), the energy collected by the absorber per day.

Part (b) (iii), calculation of the quantity of energy per day to heat the water was challenging to many candidates.

General Comments and Recommendations

(a) There is a greater need to cover the topic of heat transfer with relevant examples.

(b) The idea of using appropriate units is again a topic of weakness.

(c) A simple mathematical skill like changing the subject of the formula needs to be developed.

Question 5

The question tested candidates’ knowledge of Current-Voltage characteristics of an unknown electrical component. Candidates were asked to solve a problem dealing with the electrical circuit in a room. This was followed by another problem relating to the fuse. A few candidates scored the full 15 marks but the vast majority 69 per cent scored less than half of the full marks.

Areas of Good Performance

Candidates were quite competent at dealing with Ohm’s Law and electrical power in Parts (b) (ii) and (c).
Areas of Weak Performance

Candidates showed some confusion in the use of the rheostat and voltmeter placement in Parts (a) and (b) (i).

Calculations involving series and parallel combinations of resistors also proved challenging.

General Comments and Recommendations

(a) There is clearly the need for more practical work on I-V characteristics and series, and parallel circuits.

(b) Techniques in how to answer exam questions should be part of a candidate’s preparation.

Question 6

This question tested candidates’ knowledge of the physics of the atom. This question was poorly done with very few candidates scoring full marks.

Areas of Good Performance

Part (c) which required candidates to calculate the energy released in a solar fusion proved to be the area widely known by candidates.

Areas of Weak Performance

Part (a) which required a detailed description of types of radiation was not done well by the majority of candidates.

General Comments and Recommendations

Candidates need to be equipped with experience in writing up experiments.

Paper 03/2 – Alternative to SBA

Question 1

This question was concerned with the melting point of naphthalene. It involved getting data from a graph, interpreting the graph and writing up a description of the relevant experiment.

It was fairly well done by the majority of candidates with 70 per cent scoring more than 8 of the 17 available marks.

Areas of Good Performance

The candidates were able to read off the temperature values associated with time on the cooling curve. They were also familiar with the conversion from degrees Celcius to the Kelvin scale.

Area of Weak Performance

Part (d) was difficult for most candidates as they were weak in the description of a cooling curve for naphthalene.
General Comments and Recommendations

(a) This experiment is a core experiment for preparation for the CSEC exams. It was clear that candidates lacked the experience.

(b) Teachers should identify core activities, expose their students to them and build on these experiences if time permits.

Question 2

This question involved taking measurements involved in the Hookes’ Law experiment. It also included using the data to enter in a table, drawing a graph, conducting calculations based on the graph and identifying a source of error and precaution.

It was done well by the majority of candidates with 62 per cent achieving over 11 marks out of a possible 21 marks.

Areas of Good Performance

Parts 2 (a) and 2 (b) were clearly the sections in which candidates performed well. These involved completing a table and drawing a graph.

Area of Weak Performance

Part 2 (e) which involved using the graph to determine the mass required to produce a given extension proved a challenge to most candidates.

General Comments and Recommendations

Candidates must be given adequate opportunities in developing graph-based skills.

Question 3

This question investigated the concept of resistance and required candidates to confirm or reject the assertion — the thicker a wire is, the greater will be its resistance to current. This question was not done well by the majority of candidates. Only 31 per cent of the candidates achieved 5 or more marks out of a possible score of 10.

Area of Good Performance

In Part (a), candidates generally knew the needed apparatus. Some left out the connecting wire.

Area of Weak Performance

In Part (b) placement of the voltmeter and Nichrome wire posed a problem for some candidates.

General Comments and Recommendations

This question showed the need for more exposure to electrical circuits in a practical setting.