♦ GUIDELINES FOR THE SCHOOL-BASED ASSESSMENT

RATIONALE

School-Based Assessment (SBA) is an integral part of student assessment in the course covered by this syllabus. It is intended to assist students in acquiring certain knowledge, skills and attitudes that are critical to the subject. The activities for the School-Based Assessment are linked to the "Suggested Practical Activities" and should form part of the learning activities to enable the student to achieve the objectives of the syllabus.

During the course of study of the subject, students obtain marks for the competencies they develop and demonstrate in undertaking their SBA assignments. These marks contribute to the final marks and grades that are awarded to students for their performance in the examination.

The guidelines provided in this syllabus for selecting appropriate tasks are intended to assist teachers and students in selecting assignments that are valid for the purpose of the SBA. These guidelines are also intended to assist teachers in awarding marks according to the degree of achievement in the SBA component of the course. In order to ensure that the scores awarded by teachers are not out of line with the CXC standards, the Council undertakes the moderation of a sample of SBA assignments marked by each teacher.

School-Based Assessment provides an opportunity to individualise a part of the curriculum to meet the needs of students. It facilitates feedback to the students at various stages of the experience. This helps to build the self-confidence of the students as they proceed with their studies. School-Based Assessment further facilitates the development of critical skills and that allows the students to function more effectively in their chosen vocation and in everyday life. School-Based Assessment therefore, makes a significant and unique contribution to the development of relevant skills by the students. It also provides an instrument for testing them and rewarding them for their achievements.

PROCEDURES FOR CONDUCTING SBA

SBA assessments should be made in the context of normal practical coursework exercises. *It is expected that the exercises would provide authentic learning experiences.* Assessments should only be made after candidates have been taught the skills and given enough opportunity to develop them. **Sixteen** practicals over the two-year period would be considered the **minimum** number for candidates to develop their skills and on which to base realistic assessments. **These practicals MUST include all of the following:**

1. *Pendulum.*
2. *Momentum/Conservation of Energy.*
3. *Specific heat capacity/Specific Latent heat capacity.*
4. *Refraction.*
5. *Series and Parallel Circuits.*
6. *I-V Relationships.*
7. *Radioactivity Decay (Simulation).*

*Each skill must be assessed **at least three times** over the two-year period.* Candidates should be encouraged to do corrections so that misconceptions will not persist. As the assessment of certain skills, especially those requiring on-the-spot observation or involve looking at several

behaviours or criteria, teachers are advised to select not more than two skills to be assessed in any activity. The practical exercises selected to be used for assessment should make adequate demands on the candidates and the skills assessed should be appropriate for the exercises done. For the assessment of written work, the practical selected should be one that can be completed in the time allotted for the class and **the notebooks should be collected at the end of the period**.

Candidates who have not been assessed over the two-year period will be deemed absent from the whole examination. Under special circumstances, candidates who have not been assessed at all points may, at the discretion of CXC, have their marks pro-rated (adjusted proportionately).

1. In preparation for an SBA practical, the teacher should:

(a) select tasks which must include the **seven** (7) topics on page 53 and should be related to a given syllabus objective. These tasks may be chosen from the "Suggested Practical Activities" and should fit in with the normal work being done in that class;

(b) list the materials including quantities and equipment that will be needed for each student;

(c) carry out the experiment beforehand, if possible, to ascertain the suitability of materials and the kind of results (observations, readings) which will be obtained, noting especially any unusual or unexpected results;

(d) list the steps which will be required by the candidates in performing the experiment. From this it will be clear to the teacher how the candidates should be arranged in the laboratory, whether any sharing of equipment or materials is necessary, the skills which can be assessed from the practical, and the instructions to be given;

(e) list the skills that may be assessed (for example, observation/recording/reporting, analysis and interpretation). **No more than two practical skills should be assessed from any one activity;**

(f) select the skills to be assessed on this occasion. Skills other than those required for that year should also be included for teaching purposes;

(g) work out the criteria for assessing each skill. This will form the basis of a mark scheme and a checklist.

2. The teacher should carry out the assessment and record the marks.

This is the most critical step in the assessment process. For a teacher to produce marks that are reliable, the marking must be consistent for all candidates and the marks should reflect the standard of performance at the level. The teacher must be able to justify the marks, and this occurs when there is a fixed set of conditions, factors or criteria for which the teacher looks. Marks should be submitted electronically to CXC on the SBA form provided. *The forms should be dispatched through the Local Registrar by the Moderator to reach CXC by 30 April of the year of the examination.*

ASSESSMENT OF PRACTICAL SKILLS

School-Based Assessment will assess skills under the profiles Experimental Skills and Use of Knowledge (Analysis and Interpretation only).

The assessment will be conducted during Terms 1 - 5 of the two-year period following the programme indicated in the Table below.

SBA SKILLS TO BE ASSESSED FOR CXC MODERATION

PROFILE	SKILLS	YEAR 1		YEAR 2		*TOTAL*		
		NO. OF TIMES SKILLS TO BE ASSESSED	MARKS	NO. OF TIMES SKILLS TO BE ASSESSED	MARKS	NO. OF TIMES SKILLS TO BE ASSESSED	*MARKS*	
XS	Manipulation/ Measurement	1	*10*	*2*	*20*	***3***	*30*	*90* ***(30*)***
	Observation/ Recording/ Reporting	1	*10*	*2*	*20*	*3*	*30*	
	Planning and Designing	2	*20*	*1*	*10*	*3*	*30*	
UK	Analysis and Interpretation	2	*20*	*1*	*20*	*3*	*40*	*40* ***(10*)***
	TOTAL	6	*60*	*6*	*70*	*12*	*130*	*40**

***Weighted mark**

Investigative project to be done in Year 2.

The investigative project would be assessed for two skills, Planning and Design and Analysis and Interpretation.

Students who are pursuing two or more of the single science subjects (Biology, Chemistry, Physics) may opt to carry out ONE investigation* only from any of these subjects.
[ONLY the marks for the investigation can be transferred across subjects.]

ASSESSMENT OF INVESTIGATION SKILLS

Proposal (Planning and Design)

The maximum marks available for the Proposal is ***10 marks***

The format for this part is shown below

Observation/Problem/Research question stated	
Hypothesis	*2 marks*
Aim	*1 mark*
Materials and Apparatus	*1 mark*
Method	*2 marks*
Controlled variables	*1 mark*
Expected Results	*2 marks*
Assumptions, Precautions/ Limitations	*1 mark*
TOTAL	***10 marks***

Implementation (Analysis and Interpretation)

The maximum marks available for the Implementation i*s* ***20 marks***

The format for this part is shown below.

Method	*1 mark*
Results	*4 marks*
Discussion	*5 marks*
Limitation	*3 marks*
Reflection	5 marks
Conclusion	*2 marks*
TOTAL	***20 marks***

REPORTING FORMAT OF INVESTIGATION

PART A THE PROPOSAL (Planning and Design)

Statement of the Problem – Can be an observation, a problem
Hypothesis
Aim – Should be related to the hypothesis
Materials and Apparatus
Method – Should also include variables
Assumptions/Precautions
Expected Results

PART B THE IMPLEMENTATION (Analysis and Interpretation)

Method - Linked to Part A (change of tense)
Results
Discussion – Explanations/Interpretations/Trends
Limitations
Reflections
Conclusion

CRITERIA FOR ASSESSING INVESTIGATIVE SKILLS

A. PLANNING AND DESIGN

HYPOTHESIS		**2**
- *Clearly stated*	*1*	
- *Testable*	*1*	
AIM		**1**
- *Related to hypothesis*	*1*	
MATERIALS AND APPARATUS		**1**
- *Appropriate materials and apparatus*	*1*	
METHOD		**2**
- *Suitable*	*1*	
- *At least one manipulated or responding variable*	*1*	
CONTROLLED VARIABLE		**1**
-*Controlled variable stated*	*1*	
EXPECTED RESULTS		**2**
- *Reasonable*	*1*	
- *Link with method*	*1*	
ASSUMPTIONS/PRECAUTIONS/POSSIBLE SOURCES OF ERRORS		**1**
- *Any one stated*	*1*	
TOTAL		**(10)**

B. ANALYSIS AND INTERPRETATION

METHOD		**1**
Linked to Proposal, Change of tense		
RESULTS		**4**
- Correct formulae and equations:	*2*	
Accurate (2)		
Acceptable (1)		
- Accuracy of data:	*2*	
Accurate (2)		
Acceptable (1)		
DISCUSSION		**5**
- Explanation	*2*	
Development of points:		
Thorough (2)		
Partial (1)		
- Interpretation	*2*	
Fully supported by data (2)		
Partially supported by data (1)		
- Trends:	*1*	
Stated		
LIMITATIONS		**3**
-Sources of error identified	*1*	
-Precautions stated	*1*	
-Limitation stated	*1*	
REFLECTIONS		**5**
- Relevance between the experiment and real life	*1*	
(Self, Society or Environment)		
- Impact of knowledge gain from experiment on self	*1*	
- Justification for any adjustment made during experiment	*1*	
- Communication of information	*2*	
(Use of appropriate scientific language, grammar and clarity of expression all of the time (2); some of the time (1)		
CONCLUSION		**2**
- Stated	*1*	
- Related to the aim	*1*	
TOTAL		**(20)**

EXEMPLAR OF INVESTIGATIVE PRACTICAL

EXEMPLAR 1

PART A-THE PROPOSAL

Observation

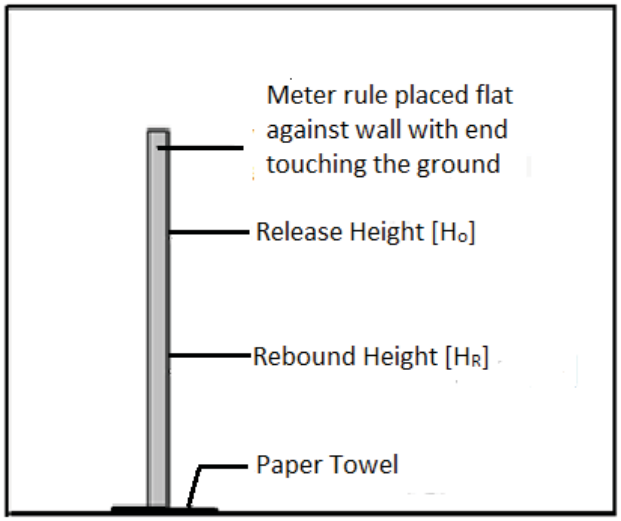
During lunch break at school Darren noticed his rubber ball did not bounce as high as it normally would when it landed on a paper towel. Darren now claims if more paper towels are added the ball's rebound height would decrease.

Hypothesis: The height of rebound of a rubber ball decreases with the addition of paper towels.

Aim: To investigate the height of rebound [H_r] of a rubber ball with increasing paper towels.

Apparatus: Meter rule; paper towels; rubber ball; pencil.

Diagram



Variables

Independent – Number of paper towels
Dependent – Height of rebound
Controlled/ Constant – Rubber Ball; Height of Release

Method

1. Securely place meter rule vertically against a wall.

2. Mark off a suitable release height [$\mathbf{H_O}$] , [the ball must be allowed to FALL vertically and REBOUND on nearly the same straight line].

3. With no paper towels at the base of the meter ruler, release the rubber ball from the marked height [the ball must be completely above the marked line with its bottom edge just touching the line].

4. Observe and record the rebound height of the ball [$\mathbf{H_R}$], [this should be done from in front of the ruler and eye level]. Repeat twice for this number of paper towels. Record all data.

5. Place a single paper towel at the base of the ruler and release it from marked height.

6. Observe and record the rebound height of the ball. Repeat steps 4 and 5 twice for that number of paper towels, recording all data.

7. Continue adding paper towels and repeat step 6 until there are 8 paper towels.

8. Calculate average rebound height [H_r] for each number of paper towels.

9. Plot a graph of Rebound Height [y axis] against Number of paper towels [x axis]

Expected Results

The rubber ball will reach maximum rebound height when it bounces on the ground with no paper towels present. As the paper towels are added it will rebound to a consistently lower height.

PART B- THE IMPLEMENTATION

Method

1. The meter rule was securely placed vertically against a wall with the 0 cm end touching the ground.

2. The release height, H_o, was set at 60 cm.

3. With no paper towels at the base of the meter ruler, the rubber ball was released from the 60 cm mark and the height of rebound was recorded. This step was repeated two more times and the data recorded.

4. A single paper towel was placed at the base of the ruler and the ball was released from the 60 cm mark. The new height of rebound was recorded. This was repeated two more times and data recorded.

5. Another paper towel was added and the rubber ball was released three times from the 60 cm mark. All rebound heights were recorded.

6. Step 5 was repeated until there were 7 paper towels at the base of the ruler.

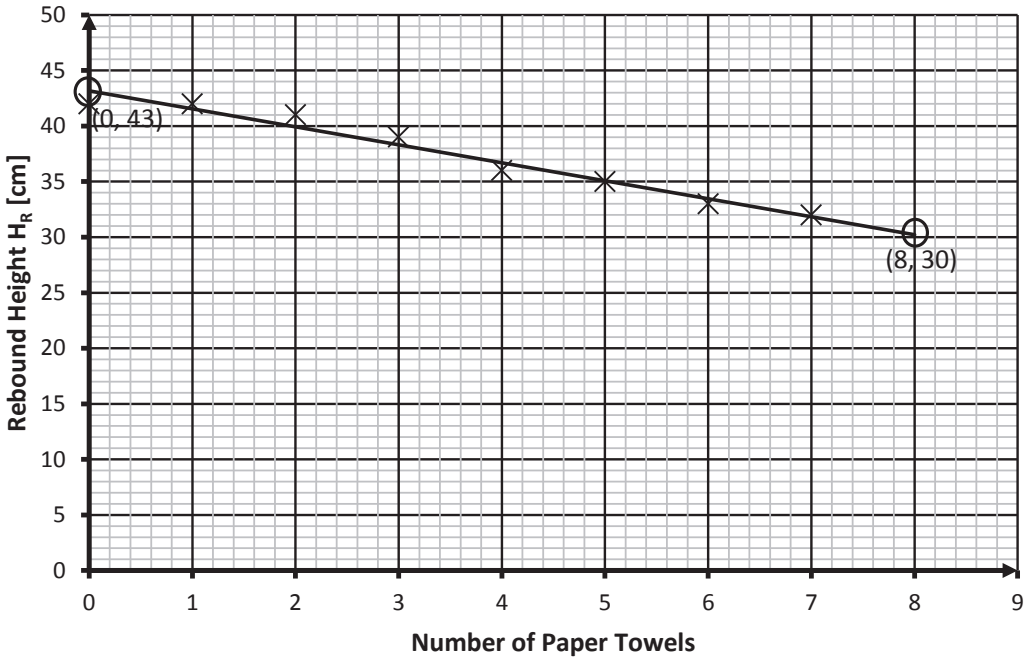
7. The average rebound height [H_r] was calculated for each number of paper towels.

8. A graph of Rebound Height [y axis] against Number of paper towels [x axis] was plotted.

Results

# of paper towels	Rebound Height, H_R[cm] (Attempts)			Average Rebound Height, H_R[cm]
	1	2	3	
0	42	43	42	42
1	42	42	42	42
2	41	41	41	41
3	39	40	39	39
4	36	35	36	36
5	34	35	35	35
6	33	33	33	33
7	32	32	32	32

Graph of Rebound Height Against Number of Paper Towels for a Rubber Ball



Calculations

Using points (0, 43) and (8, 30) to calculate the slope/gradient:

$$\begin{aligned} S &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{43 - 30}{0 - 8} \\ &= \frac{13}{-8} \\ &= -1.6 \text{ (cm/paper towel)} \end{aligned}$$

Discussion

When the results were represented on a graph, the points defined a straight line. This allows the relation between the rebound height and the paper towels to be described by a linear equation of the form:

$$y = mx + c$$

Where y = Rebound height, x = number of paper towels, m = slope/gradient and c = intercept on the y-axis.

From the calculations the relation between the paper towels and the rebound height of the ball is described by:

$$R_H = -1.6N + 43$$

Where R_H is the rebound height and N is the number of paper towels.

When N = 0, the rebound height is 43 cm. As N increases, R_H decreases because the slope is negative. According to the relation, the rebound height will be zero when the number of paper towels is approximately 27.

Limitations

Sources of Error/Limitation

The ball achieves its rebound height for a very short time. To measure this height during this short time was difficult. At times only an approximation can be made. This introduces an error and a limitation in determining the accurate rebound height whenever a paper towel is added.

Precautions

Read rebound heights perpendicular to the ruler.
Repeat the experiment for each number of paper towels at least 3.

Reflections

The paper towels used in this experiment are much softer than the ground and the ball. This indicates that the paper towels decreases the rate of change of momentum of the ball and as a result decreases the force of impact of the ball with the ground. The reduction in the force of impact is as a result of the work done in compressing the paper towels on impact. Thus, the ball has less energy to rebound and as a result its rebound height decreases.

Conclusion

The rebound height decreases with increasing number of paper towels.

Exemplar 2

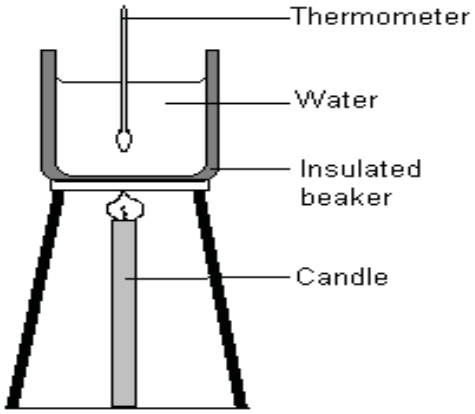
PART A - THE PROPOSAL

Observation

During a power outage one night, Devon lit a candle and without thinking, placed it near to his bedroom wall. Shortly after, the power was restored. He was surprised when he noticed the wall was warm. The following day in school he told some classmates about this and they decided to see how much energy a candle could release in a few minutes.

Aim: To investigate the heat energy released by a candle in 5 minutes.

Apparatus: Tripod stand; candle; insulated beaker; stirrer; thermometer; retort stand.



Variables

Independent – Time for which candle is lit
Dependent – Energy Released
Controlled – volume of water

Method

1. Fill the beaker up to the 300 ml mark with distilled water and place it on the tripod stand.

2. Using the retort stand, suspend the thermometer in the centre of the beaker [ensure the thermometer does not touch the bottom of the beaker]. Observe and record initial temperature of the water.

3. Place candle directly under the tripod stand and light it [ensure the flame is as close to the bottom of the beaker as possible].

4. Let the candle light for 5 minutes. Observe and record the final temperature of the water.

5. Calculate the heat supplied by the candle using the formula $E_H = mc\Delta\Theta$.

Expected Results

The temperature of the water will increase by as much as 5^{o} or more.

PART B - THE IMPLEMENTATION

Method

1. The beaker was filled up to the 300 ml mark with distilled water and placed on the tripod stand.

2. Using the retort stand, the thermometer was secured at the centre of the beaker so that it does not touch the bottom of the beaker. The initial temperature of the water was measured and recorded.

3. The candle was placed directly under the tripod stand and lit. It was ensured the flame was as close to the bottom of the beaker as possible. The stop watch was started simultaneously.

4. The candle was allowed to be lit for 5 minutes .

5. The final temperature of the water after the five minutes was measured and recorded.

6. The heat supplied by the candle was calculated using the formula $E_H = mc\Delta\Theta$.

Results

Initial Temperature of water [Θ_1] = 28°C
Final Temperature of water [Θ_2] = 34°C
Volume of water = 300 ml

Calculations:

Temperature change [$\Delta\Theta$] = $\Theta_2 - \Theta_1$ [note the temperature change in degrees Celsius is the same as in Kelvin] = 34 – 28 = 6 K

Mass of water = Volume of water × Density of water
= $300cm^3 \times 1g/cm^3 = 300g = 0.3kg$
E_H = mass of water × temperature change × specific heat capacity of water
E_H = 0.3 kg × 6 K × 4200 J/kg/K
E_H = 7560 J

Discussion

The amount of energy released by a candle in 5 minutes was of the order of several kilojoules. If the candle was lit for a longer period of time more energy would be released. It requires 90,720 J of heat energy to bring 300 g of water to its boiling point. According to the calculations, it would take the candle approximately 12 minutes to accomplish this task.

Limitations

Sources of Error/Limitation
Not all the heat energy produced by the candle was absorbed by the water. Some heat energy was absorbed by the beaker and tripod stand. Hence, the heat energy yielded for this experiment is only a fraction of the total heat energy produced by the candle.

Precautions
Read temperature perpendicular to the scale and above the meniscus.
Place candle as close to the beaker as possible

Reflections

Candles are commonly used during power outages as a source of light. A lit candle generates both light energy and heat energy. The latter being the greater energy produced. These cheap and common light sources can be dangerous if attention is not paid to how and where they are placed.

Conclusion

The heat energy released by the candle in 5 minutes is 7560 J.

Moderation of School-Based Assessment

The reliability (consistency) of the marks awarded by teachers on the School-Based Assessment is an important characteristic of high quality assessment. To assist in this process, the Council undertakes on-site moderation of the School-Based Assessment conducted by visiting external Moderators.

The Moderator will make a first visit in Term 3 of Year 1. Teachers must make available to the Moderator ***ALL*** *Assessment Sheets (Record of Marks, Mark Schemes and the proposal for the Investigation).*

During the Term 2 of Year 2, the Moderator will make a second visit. Teachers must make available to the Moderator ***ALL*** *Assessment Sheets (Record of Marks, Mark Schemes and the report on the Investigation).* ***Teachers are NOT required to submit to CXC samples of candidates' work, unless specifically requested to do so by the Council BUT will be required to submit the candidates' marks electronically.***

The Moderator will remark the skills, and investigation reports for a sample of five candidates, who are selected using the guidelines listed below.

1. *Candidates' total marks on the SBA are arranged in descending order (highest to lowest).*

2. *The sample comprises the work of the candidates scoring the:*

    (a) *highest Total mark;*
    (b) *middle Total mark;*
    (c) *lowest Total mark;*
    (d) *mark midway between the highest and middle Total mark;*
    (e) *mark midway between the middle and lowest Total mark;*

3. *The candidates selected above may be required to demonstrate some practical skills.*

Teachers' marks may be adjusted as a result of the moderation and feedback will be provided by the Moderator to the teachers.

The Moderator may re-mark the assignments of additional candidates. Where the total number of candidates is five or fewer, the Moderator will remark ***ALL****.*

On the first visit, the Moderator will re-mark a sample of the Year 1 candidates. A copy of this report must be retained by the teacher, and be made available to the Moderator during Term 2 of Year 2.

The Moderator will submit the Assessment Sheets, moderation of SBA Sample and the moderation reports to the Local Registrar by April 30 of the year of the examination. A copy of the Assessment Sheets and candidates' work must be retained by the school for three months after the examination results are published by CXC.

School-Based Assessment Record Sheets are available online via the CXC's website www.cxc.org.

All School-Based Assessment Record of marks must be submitted online using the SBA data capture module of the Online Registration System (ORS).

STRATEGIES FOR ASSESSING PRACTICAL OBJECTIVES

The basic strategy for assessing practical objectives in Physics comprises the following:

STEP I

Selection of the task or investigation and the corresponding syllabus objectives.

STEP II

1. Preparing the apparatus and the teacher performing the activity.

2. Determining and selecting skills to be assessed.

3. Developing the criteria for assessing each skill.

4. Designing rating scales based on the criteria.

STEP III

Breakdown of work to be done by candidate.

STEP IV

Carrying out assessment and recording marks.

Further explanation of Steps I-IV
The following is a more detailed explanation of what should take place in Steps I - IV.

Re: STEP I

The selection of the task or investigation should be done along with the preparation of the scheme of work for the term or year for each class. The task selected should contribute to the development of skills and attitudes within the subject and match a given syllabus objective (general or specific). Both qualitative and quantitative work should be included.

Re: STEP II

1. After selection of the task the teacher should prepare the required apparatus and materials. The teacher should perform the activity before presentation to the candidates as this can help in determining the steps involved and the skills that can be assessed (see Step III).

2. Before selecting the skills to be assessed the teacher should list all the skills that could be assessed. This may be achieved by preparing a step by step outline of the task and noting the skills involved in each step. Teachers are advised whenever possible to select only one skill to be assessed in any one activity.

3. Developing the criteria for assessing each skill is the most critical step in the assessment process. For a teacher to produce marks that are reliable the marking must be consistent for all candidates and the marks should reflect the standard of performance at the level. The teacher must be able to justify the marks and this occurs when there is a fixed set of conditions, factors or criteria for which the teacher looks.

CRITERIA FOR THE ASSESSMENT OF EACH SKILL

For each skill there may be a number of general criteria from which the teacher may select depending on the nature of the activity. It is especially important to make such a selection when there are numerous criteria as it is difficult to assess more than a few at a time without sacrificing accuracy. The following lists represent general criteria as may be defined under a particular skill:

A. OBSERVATION/RECORDING/REPORTING

(i) Selects appropriate observations.
(ii) Makes accurate recordings/observations.
(iii) Uses appropriate format of presentation.
(iv) Uses acceptable language/expression.
(v) Uses appropriate tables/diagrams/graphs.

B. MANIPULATION/MEASUREMENT

(i) Follows instructions.
(ii) Uses basic laboratory equipment correctly.
(iii) Sets up electrical circuits correctly.
(iv) Uses electrical circuits correctly.
(v) Prepares material for observation or investigation correctly.

C. *PLANNING AND DESIGNING*

(i) Suggests appropriate hypotheses.
(ii) Suggests suitable and feasible methods for data collection.
(iii) Identifies and controls variables appropriately.
(iv) Takes account of possible sources *of error or danger.*

D. ANALYSIS AND INTERPRETATION

(i) Makes accurate calculations and logical inferences from data.
(ii) Predicts from data.
(iii) Evaluates data (including sources of error).
(iv) Identifies relationships and patterns within data.

NOTE: Plotting and drawing of graphs would be assessed in Observation/Recording/Reporting whereas inferences from graphs would be assessed under Analysis and Interpretation.

Using a Checklist

Assessing candidates in some of the skills could be conveniently done by marking the candidates' laboratory notebooks. However, in the skills Manipulation/Measurement teachers will find it easier to write down marks as the activity is occurring. A convenient way of doing this is by using checklists. The column headings reflect what the teacher is looking for and a tick may be used to show that the candidate was displaying a satisfactory behaviour. More than one tick may occur in one column if the teacher checks a candidate more than once during the activity. A zero may be used to show that the candidate was displaying an unsatisfactory behaviour. The ticks and zeros should help the teacher decide on a mark for a candidate (see below).

CHECKLIST FOR USE OF A MEASURING CYLINDER

NAMES	Rests on flat surface	Meniscus read to avoid parallax	Bottom of meniscus read	MARK
L. Allie				
H. Cassie				
S. Williams				
D. Wong				

4. If the criteria are clear and adequate, a rating scale is relatively easy to define. The range required by the syllabus is an 11-point scale ranging from 0-10. If the number of criteria is small then several assessments may be necessary, perhaps of different pieces of apparatus in one activity.

   It is important that a record of the criteria and rating scale used for each activity be kept to avoid duplication and it is advisable to submit, along with the final mark sheet of candidates' scores, a copy of such record.

Re: STEP III

The teacher should prepare a step by step outline of the task. Such an analysis would provide a good guide as to the format of the sessions, for example, work stations, groups, individual and worksheets, experimental format and the skills and objective(s) which may be assessed.

Re: STEP IV

A Teacher's Mark Book (which is retained by the school) should contain all the marks from which the averages are derived. The SBA Form which is submitted to CXC shows only the candidate's average mark at each point in each skill to be assessed at the point. At the end of this appendix is an example of the SBA Form and a possible format of a Teacher's Mark Book.

LABORATORY NOTEBOOKS

A sample of laboratory notebooks will be required to help moderate the teacher's scores.

1. The notebook should contain all the practical work that the candidate does (not only that which is assessed).

2. It is advisable for three pages to be left blank at the front of the practical notebook for a list of contents giving the practical activity and the date on which it was performed.

3. The activities used for SBA should be indicated.

4. The marks awarded for each skill selected within an activity should be indicated.

5. The notebooks should contain a variety of practical activities that are spread over the entire syllabus. Teachers may wish to consider some of the questions set by CXC in Question 1 of the Practical examination prior to 1997 as possible examples of open-ended investigative activities.

SELECTION OF ACTIVITIES

Teachers must bear in mind that opportunities for the development of the skills in the SBA are needed before their assessment. Again the point is made that practicals of a more open-ended, investigatory nature should also be utilized. Teachers should refer to the “Suggested Practical Activities" for ideas for practical work in the different section of the syllabus.

APPLYING THE ASSESSMENT STRATEGY

EXAMPLE

The following is an example of how the strategy may be applied to a specific task:

STEP I

To investigate the factors which might affect the period of simple pendulum (Specific Objective Section A 1.2).

STEPS II AND III

Apparatus per candidate or group

Stand or clamp, fine thread, several small objects of various masses for use as pendulum bobs, stop watch, metre rule.

1. Outline of task

(a) Sets up apparatus appropriately.
(b) Controls variables (in procedure).
(c) Times several oscillations more than once.
(d) Averages sensible results.
(e) Compares results and draws appropriate conclusions.

2. Manipulation/Measurement is the skill selected for assessment.

3. Manipulation/Measurement

Criteria for assessment.

(a) Uses vertical reference lines.
(b) Measures length of pendulum to centre of bob.
(c) Checks zero error on stop clock or stop watch.
(d) Operates clock or watch correctly.
(e) Uses count down method.
(f) Reads scale to avoid parallax.

Note: The same experiment could have been used to assess Planning and Designing as follows:

Planning and Designing

(i) identifies appropriate variables.
(ii) maintains all but one variable constant for one series of readings.
(iii) times a reasonable number of oscillations.
(iv) repeats timing for same number of oscillations under same conditions.

4. Teacher's rating scale

STEP IV

Assessment performed and marks entered in Teacher's Mark Book.

RECORDING FOR SBA

Teacher's Mark Book

SKILL	OBSERVATION/RECORDING/ REPORTING			MANIPULATION/ MEASUREMENT			ANALYSIS AND INTERPRETATION				PLANNING AND DESIGNING				TOTAL
Date	18/1	Total	Out of 10	10/12	Total	Out of 10	25/1	28/3	Tot.	Out of 20	3/2	31/3	Tot.	Out of 20	YEAR 1
Maximum Mark	12	12		8	4		15	10	25		8	9	17		60
Ammar, Annette	12	5	9	7	4	9	10	8	18	14	6	5	11	12	
McNab, Bryan	10	4	6	6	3	7	12	10	22	18	3	2	5	6	
Singh, Ricki	4	2	3	4	3	7	1	5	6	4	2	7	9	10	
Thompson, Neil	9	5	8	8	3	8	8	4	12	10	4	9	13	16	
Wong, Claudette	7	4	6	3	2	5	14	9	23	18	3	4	7	8	

Teacher's Mark Book

SKILL	OBSERVATION/RECORDING/				MANIPULATION/ MEASUREMENT				ANALYSIS AND INTERPRETATION			PLANNING AND DESIGNING			TOTAL
Date		14/3	Tot.	Out of 20		20/4	Tot.	Out of 20		Tot.	Out of 10	3/2 31/3	Tot.	Out of 20	YEAR 1
Maximum Mark		6	27			4	18			25		8 9	17		70
Ammar, Annette		5	25			4	16			18		6 5	11		
McNab, Bryan		4	16			3	11			22		3 2	5		
Singh, Ricki		2	9			3	12			6		2 7	9		
Thompson, Neil		5	21			3	14			12		4 9	13		
Wong, Claudette		4	17			2	9			23		3 4	7		

N.B.:

1. Although more than one skill may be assessed by any one component, the marks are more objective if the teacher concentrates on assessing one skill during a particular period of time.

2. **Note that no special assessment exercises need to be planned. The teachers will, as is customary, be recording periodic "marks" for their candidates. The difference is that, since these "marks" will now contribute to an assessment external to the school, they need to be more directed. Several of the objectives can be assessed from work which would normally be collected for marking.**

CARIBBEAN EXAMINATIONS COUNCIL

SCHOOL-BASED ASSESSMENT IN PHYSICS7

NAME OF SCHOOL:_____ SCHOOL CODE:_____ YEAR OF FINAL EXAMINATION_____

NAME OF TEACHER:_____ TERRITORY:_____

REGISTRATION NUMBER	CANDIDATES NAME	YEAR 1				TOTAL	YEAR 2				TOTAL	TOTAL			COMMENTS
		XS MM	XS ORR	XS PD	UK AI	Year 1	XS MM	XS ORR	XS PD	UK AI	Year 2	PROFILE		OVERALL	
		P3 (10)	P3 (10)	P3 (20)	P2 (20)	60	P3 (20)	P3 (20)	P3 (10)	P2 (20)	70	P3 (90)	P2 (40)		

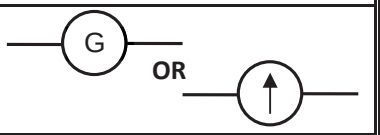
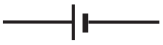
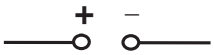
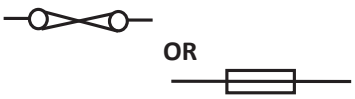
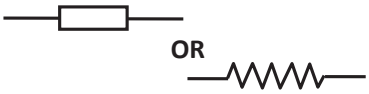
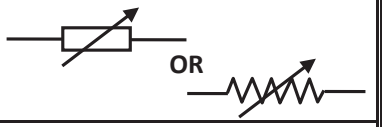
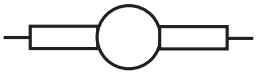
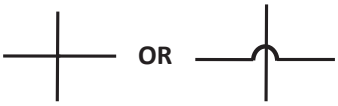
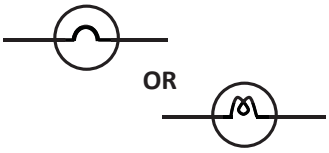
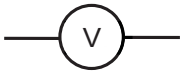
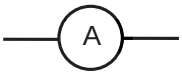
TEACHER'S SIGNATURE:_____ PRINCIPAL'S NAME: _____

DATE: _____ **PRINCIPAL'S SIGNATURE:** _____

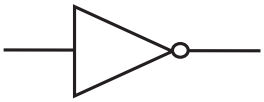
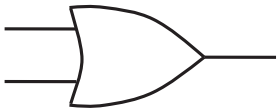
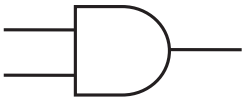
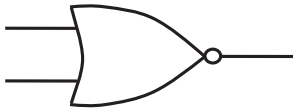
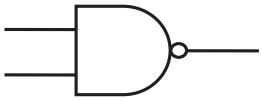
♦ LIST OF PHYSICAL QUANTITIES AND THEIR SYMBOLS

NAME OF QUANTITY	SYMBOL	NAME OF QUANTITY	SYMBOL
ELECTRIC CURRENT	I	SPECIFIC LATENT HEAT	
LENGTH	l	OF FUSION	l_f
MASS	m	OF VAPORISATION	l_v
TEMPERATURE: (KELVIN)	T	WAVELENGTH	λ
(CELSIUS)	θ	PERIOD	T
TIME	t	AMPLITUDE	a
VOLUME	V	FREQUENCY	f
AREA	A	OBJECT DISTANCE	u
ANGLE	θ	IMAGE DISTANCE	v
DENSITY	ρ	FOCAL LENGTH	f
RELATIVE DENSITY	ρ_r	REFRACTIVE INDEX	n
FORCE	F	LINEAR MAGNIFICATION	m
MOMENT OF FORCE OR TORQUE	T	ELECTRIC CHARGE	Q
DISPLACEMENT, DISTANCE	s, x	POTENTIAL AND POTENTIAL DIFFERENCE	V
SPEED, VELOCITY	v	ELECTRO-MOTIVE FORCE	E
ACCELERATION	a	RESISTANCE	R
MOMENTUM	P	WEIGHT (GRAVITATIONAL FORCE)	W
ENERGY	E, W	ACCELERATION DUE TO GRAVITY	g
WORK	W	MASS OF ELECTRON	m_e
POTENTIAL ENERGY	E_P	CHARGE OF ELECTRON	e
KINETIC ENERGY	E_K	PROTON (ATOMIC) NUMBER	Z
THERMAL ENERGY	E_H	NUCLEON (MASS) NUMBER	A
POWER	P	NEUTRON NUMBER	N
PRESSURE	P	HALF LIFE	$T_{½}$
SPECIFIC HEAT CAPACITY	c	VELOCITY OF LIGHT IN VACUO	c
HEAT CAPACITY	C		

♦ LIST OF GRAPHICAL SYMBOLS AS USED IN CIRCUIT DIAGRAMS

DESCRIPTION	GRAPHICAL SYMBOL(S)	DESCRIPTION	GRAPHICAL SYMBOL(S)
EARTH		GALVANOMETER	
CELL		SEMI-CONDUCTOR DIODE	
BATTERY OF CELLS		ELECTROLYTIC CELL OR VOLTAMETER	
D. C. SUPPLY		FUSE	
A. C. SUPPLY		FIXED RESISTOR	
SWITCH		VARIABLE RESISTOR	
JUNCTION OF CONDUCTORS		ELECTRIC MOTOR	
ONE WIRE CROSSING ANOTHER NO ELECTRICAL CONNECTION		LOUDSPEAKER	
FILAMENT LAMP OR BULB		TRANSFORMER	
VOLTMETER		GENERATOR	
AMMETER			

LIST OF GRAPHICAL SYMBOLS AS USED IN CIRCUIT DIAGRAMS (cont'd)

DESCRIPTION	GRAPHICAL SYMBOL(S)	DESCRIPTION	GRAPHICAL SYMBOL(S)
NOT		OR	
AND		NOR	
NAND			

RECOMMENDED MINIMUM EQUIPMENT LIST

(Recommended quantity per 25 candidates)

	QUANTITY	ITEM		QUANTITY	ITEM
1.	12	Metre rule	22.	12	Double pulley
2.	12	Half metre rule	23.	1	Manometer
3.	12	Callipers	24.	1	12m length of transparent PVC tubing diameter = 3cm
4.	12	Vernier callipers	25.	8	Sets brass masses (1 x 10g; 2x20g; 1x50g; 1x100g)
5.	12	Micrometer screwgauge	26	12	Thermometer: –10°C to 110°C
6.	5	Top pan balance	27.	5	Clinical thermometer
7.	112	Spring balance (0 - 2.5)N	28.	1	Thermocouple
8.	1	Spring balance (0 - 10)N	29.	1	Ball and ring demonstration apparatus
9.	12	Stop watch (or clock)	30.	1	Bimetallic strip
10.	24	Retort stand and clamp/boss head	31.	20	Bunsen burner
11.	12	Pendulum bob	32.	12	Tripod stand and wire gauze
12.	5	Eureka/overflow can	33.	12	Beaker (100ml)
13.	2	Sets rectangular blocks of different materials having similar and different dimensions	34.	12	Beaker (250ml)
14.	12	Knife edge (commercial or improvised)	35.	12	Beaker (400ml)
15.	12	Helical spring yielding 0.5N cm^{-1}	36.	12	100 ml graduated measuring cylinder.
16.		Thread/String (as needed)	37.	6	1 metre length of glass tubing (each 4mm internal diameter).
17.	144	Straight (common) pin	38.	2	Glass funnel
18.	12	Set hook (stirrup) + set of slotted masses (10 x 100g)	39.	2	Sets rods of identical dimensions and different metals.
19.	2	Acceleration trolley	40.	1	Ripple tank and accessories
20.	1	Electronic timer	41.	1	Slinky spring
21.	12	Single pulley	42.	1	Bell jar, electric bell and vacuum pump apparatus.
			43.	12	Pinboard (of softwood or cardboard or polystyrene).

	QUANTITY	ITEM		QUANTITY	ITEM
44.	1	Ray optics kit	61.	1	Small d.c. motor (as from toy).
45.	100	Optical pins	62.	12	Variable resistors, commercial or improvised.
46.	12	Rectangular glass block	63.	2	Reel-resistance wire (bare) constantan (SWG 26)
47.	12	Right-angled triangular glass prism.	64.	2	Reel-resistance wire (bare) constantan (SWG 28).
	12	Equilateral triangular glass prism.			
48.	1	Light pipe	65.	2	Sets assorted standard resistors.
49.	12	Converging lens-focal length 10 cm	66.	12	Circuit key or switch.
50.	12	Converging lens-focal length 15 cm	67.	12	Diodes
51.	5	Diverging lens- any focal length.	68.	0.5kg	Copper sulphate ($CuSO_4$ $5H_20$)
52.	12	Thin plane mirror (each 5cm x 8cm)	69.	1	Pair-copper electrodes (thick bare copper wire suitable)
53.	12	Power pack OR accumulator OR dry cells in holder or with soldered leads	70.	1	Card-fuse wire.
54.	5	Reel-varnished or insulated copper wire SWG 24.	71.	1	110 V plug
55.	12	Ammeter (0 - 1)A	72.	1	220 V plug.
	12	Voltmeter (0-5)V	73.	1	G.M. tube + electric accessories.
	12	Analog Multimeter	74.	1	α radioactive source.
56.	30	Doz. Crocodile clips	75.	1	β radioactive source.
57.	5	Small screwdrivers	76.	1	γ radioactive source.
58.	1	Pair of pliers or wire cutter	77.	1	Set of aluminium and lead plates.
			78.	1	Diffusion cloud chamber.
59.	24	2.5V (MES) torchlight electric lamp	79.	2	1 Set-identical dice.
60.	24	MES lamp holder	80.	2	Reel-PVC insulated connecting wire.

♦ RESOURCES

Avison, J., Henry, D. and Neeranjan,	*Physics for CSEC,* United Kingdom: Nelson Thornes Limited, 2007.
Farley, A. and Trotz, C.	*CXC Physics*, Oxford: Macmillan Education, 2007.
Jackson, B. and Whiteley, P.	*Physics for CSEC*, Jamaica: Carlong Publishers (Caribbean) Limited, 2007.

♦ GLOSSARY

WORD/TERM	DEFINITION/MEANINGS	NOTES
annotate	add a brief note to a label	{simple phrase of a few words only; KC}
apply	use knowledge and principles to solve problei	{make inferences and conclusions; UK}
assess	present reasons for the importance of particular structures, relationships or processes	{compare the advantages and disadvantages or the merits and demerits of a particular structure, relationship or process; UK}
calculate	arrive at the solution to numerical problem	{steps should be shown; units must be included; UK}
cite	quote or refer to	{KC}
classify	divide into groups according to observable characteristics	{UK}
comment	state opinion or view with supporting reasons	{UK}
compare	state similarities and differences	{an explanation of the significance of each similarity and difference stated may be required for comparisons which are other than structural; UK}
construct	use a specific format to make or draw a graph, histogram, pie chart or other representation using data or material provided or drawn from practical investigations, build (for example, a model) draw scale diagram	{such representation should normally bear a title, appropriate headings and legend; UK}
deduce	make a logical connection between two or more pieces of information; use data to arrive at a conclusion	{UK}
define	state concisely the meaning of a word or term	{this should include the defining equation or formula where relevant; KC}

WORD/TERM	DEFINITION/MEANINGS	NOTES
demonstrate	show, direct attention to…	{KC}
derive	to deduce, determine or extract from data by a set of logical steps some relationship, formula or result	{this relationship etc. may be general or specific; KC}
describe	provide detailed factual information on the appearance or arrangement of a specific structure or the sequence of a specific process	{descriptions may be in words, drawings or diagrams or any appropriate combination. Drawings or diagrams should be annotated to show appropriate detail where necessary; KC}
determine	find the value of a physical quality	{UK}
design	plan and present, with appropriate practical detail	{where hypotheses are stated or when tests are to be conducted, possible outcomes should be clearly stated the way in which data will be analyzed and presented; XS}
develop	expand or elaborate on an idea or argument with supporting reasons	{KC/UK}
differentiate or distinguish (between or among)	state or explain briefly those differences between or among items which can be used to define the items or place them into separate categories	{KC}
discuss	present reasoned argument; consider points both for an against; explain the relative merits of a case	{UK}
draw	make a line representation of apparatus which shows accurate relationship between the parts	{A diagram is a simplified representation showing the relationship between components; KC/UK}
estimate	make an approximate quantitative judgement	{UK}
evaluate	weigh evidence and make judgements based on given criteria	{the use of logical supporting reasons for a particular point of view is more important than the view held; usually both sides of an argument should be considered; UK}

WORD/TERM	DEFINITION/MEANINGS	NOTES
explain	give reasons, based on recall, to account for	{KC}
find	locate a feature or obtain as from a graph	{UK}
formulate	devise a hypothesis	{UK}
identify	name or point out specific components or features	{KC}
illustrate	show clearly by using appropriate examples or diagrams, sketches	{KC/UK}
investigate	use simple systematic procedures to observe, record data and draw logical conclusions	{XS}
label	add names to identify structures or parts indicated by pointers	{KC}
list	itemise without detail	{KC}
measure	take accurate quantitative readings using appropriate instruments	{XS}
name	give only the name of	{no additional information is required; KC}
note	write down observations	{XS}
observe	pay attention to details which characterise reaction or change taking place; to examine and note scientifically	{observations may involve all the senses or extensions of them but would normally exclude the sense of taste; XS}
plan	prepare to conduct an exercise	{XS}
predict	use information provided to arrive at a likely conclusion or suggestion possible outcome	{UK}
record	write an accurate description of the full range of observations made during a given procedure	{this includes the values for any variable being investigated; where appropriate, recorded data may be depicted in graphs, histograms or tables; XS}

WORD/TERM	DEFINITION/MEANINGS	NOTES
relate	show connections between; explain how one set of facts or data depend on others or are determined by them	{UK}
sketch	Make a simple freehand diagram showing relevant proportions and any important details	{KC}
state	provide factual information in concise terms omitting explanations	{KC}
suggest	Offer an explanation deduced from information provided or previous knowledge. (... an hypothesis; provide a generalisation which offers a likely explanation for a set of data or observations.)	{no correct or incorrect solution is presumed but suggestions must be acceptable within the limits of scientific knowledge; UK}
test	to find out following set procedures	{XS}

KEY TO ABBREVIATIONS

KC - Knowledge and Comprehension
UK - Use of Knowledge
XS - Experimental Skills

Western Zone Office
12 June 2013