NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2011

LIFE SCIENCES: PAPER III

MARKING GUIDELINES

Time: 1½ hours 50 marks

These marking guidelines were used as the basis for the official IEB marking session. They were prepared for use by examiners and sub-examiners, all of whom were required to attend a rigorous standardisation meeting to ensure that the guidelines were consistently and fairly interpreted and applied in the marking of candidates' scripts.

At standardisation meetings, decisions are taken regarding the allocation of marks in the interests of fairness to all candidates in the context of an entirely summative assessment.

The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines, and different interpretations of the application thereof. Hence, the specific mark allocations have been omitted.

Teachers are asked to complete this grid after the examination.

Sufficient care taken to prevent cross-contamination of powders on tile/petri dish	1	0
Iodine solution contained in each sample and not running between samples	1	0
Same amount of solution in all three test tubes	1	0
Test tubes correctly labelled	1	0
Working independently	1	0
TOTAL		/max 5

Simply ring a 1 or a 0 for each item and fill in the total in the space provided.

10. Once your teacher has checked your work, draw a table in the space below in which you can record your results for each of the tests you performed on your three samples (white powders). The tests were: the Benedict's test for reducing sugars and the Iodine test for starch. Record any colour changes that you observed. Remember to give your table a title.

Observations: ANY reasonable observation filled in regarding the colour change, e.g. Iodine test – 'remained orange/brown or turned blue/black', Benedict's test – 'remained clear blue or turned orange/red or green precipitate formed'

6 observations × 1 mark each = 6 marks

Table:

Table is drawn with neat ruled borders	1	0
Data is presented in a single table with rows and columns	1	0
Suitable (informative) heading or title provided	1	0
Column headings suitable, e.g. sample A, B, C or salt, cornstarch, unknown sample or as for rows	1	0
Suitable labels for the rows, e.g. Benedict's test, Iodine test or as for columns	1	0
Results recorded in correct places	1	0
TOTAL		/max 6

Observations: (6)
Table: (6)

11. What conclusions can you draw about the unknown white powder found at the crime scene?

The conclusions must relate to the data given by the learners in their table.
Results for both tests must be interpreted.
ANY reasonable conclusion is acceptable here such as:
'Iodine turned blue/black indicating the presence of starch in the sample' OR
'Benedict's solution turned orange/red indicating the presence of glucose in the sample' OR
'Iodine remained orange/brown indicating no starch present' OR
'Benedict's solution remained clear blue indicating no glucose in the sample'
for identifying the implication of the result of the test
for relating it to the crime scene (2)

12. When carrying out the investigation above, describe how you worked carefully with the **dropper pipette/eye-dropper** and the **syringe** in order to get results that are as accurate as possible.

Please note that the learners must describe how they worked with each of these pieces of apparatus.
Dropper pipette/eye-dropper – Squeezed the rubber bulb gently/slowly released pressure on the rubber bulb to draw the liquid up/squeezed gently to dispense exactly 2/3 drops
Syringe – Inverted syringe to get rid of air bubbles/tapped the syringe to get the bubbles to the top/pushed the rubber plunger to line the top of the black rubber stopper with the correct mark on the syringe (4)

13. How could the design of the investigation given above be improved? Explain **two** improvements to this design.

Please note that learners must suggest new ways of doing things and cannot simply state how they carried out the given experiment. Give recognition to ANY reasonable improvement to the design of the activity. Learners must supply two examples and describe them properly for each correctly described improvement.
For example:
Use a mass meter to measure out exact amounts of samples to be tested.
Use a proper water bath to accurately control the temperature at which the test tubes are incubated.
Repeat the experiment several times to check for errors.
Use a properly calibrated pipette to measure accurate amounts of solutions and reagents.
ANY other reasonable improvement is acceptable within the scope of this task. (4)

You are now going to design a completely new experiment.

14. Design an experiment in which you determine the sensitivity of the Benedict's solution to detecting the amount of glucose in a sample. You may use any equipment that you would find in your school laboratory.

MAKE SURE THAT YOU HAVE READ THE INFORMATION SHEET CAREFULLY BEFORE YOU CARRY ON.

14.1 State your hypothesis.

Benedict's solution is only sensitive enough to measure glucose concentrations that are in excess of x mg/l OR Benedicts solution can/cannot measure varying glucose concentrations
OR
ANY similar statement
Wording (must make mention of the sensitivity of the test and reference to amount/concentration of glucose) (3)

14.2 State your aim.

To determine the sensitivity of the Benedict's test to concentration of glucose in solution.
OR
ANY similar aim.
for mention of the sensitivity of the test/ability to detect glucose
for mention of amount/concentration of glucose (2)

14.3 Identify the independent variable.

Amount/concentration of glucose in solution. (2)

14.4 Identify the dependent variable.

Response of the Benedict's solution to the sample, i.e. the colour change. (2)

14.5 List any three controlled/fixed variables and state precisely **how** they will be controlled to ensure fair testing.

Please accept a range of ANY reasonable answers relating to the method. Candidates MUST provide a decent explanation as to how the variable is controlled in order to get the second mark.
For example:
Temperature at which test tubes are incubated – place all test tubes in a thermostatically-controlled water bath.
Lengths of time that the test tubes are incubated for – place all test tubes into the water bath at the same time and remove them together.
Amount of Benedict's solution added to the samples must be constant – use the same piece of dispensing apparatus for all samples. (6)

14.6 Outline your own **new** method using numbered points or bullet points.

Please use the simple rubric below to assess this answer. There is no correct/incorrect method. Marks are awarded for the skill of being able to write a method. An example of a method for the given experiment is as follows:

(1) Prepare a standardised solution of glucose by accurately measuring a known mass (mass meter) of glucose powder and dissolving it completely in a known volume of distilled water (volumetric flask).
(2) Prepare a range of serial dilutions by removing 1 ml of the solution and diluting with water to make up to 10 ml. Repeat until you have a range of dilutions (pipette/syringe).

(3) Add 4 ml of Benedict's solution to all tubes (syringe).
(4) Place all tubes in a boiling water bath for 5 minutes exactly (stopwatch).
(5) Remove all tubes at the same time and note all colour changes.
(6) Note the point at which there is no colour change (remains clear blue).
(7) At this point the Benedict's solution is no longer sensitive to glucose in solution. (8)

	3	2	1	0
Method laid out as a series of steps that are bulleted or numbered			Method laid out as a series of steps that are bulleted or numbered	Method not given as a series of bulleted or numbered steps
Method relates to the aim			Method actually tests the aim given by the learner in 14.2	Method is not related to the aim given by the learner in 14.2
Method chosen is appropriate and relevant to the task	All 3 criteria met: (1) Method given is unique and an extension of the method given in the examination (2) Method is complete (3) Method achieves a definite result	Two criteria met	One criterion met	No criteria met
Equipment chosen is appropriate and used correctly		Equipment selected by learner is both appropriate to the task and used correctly	Equipment chosen is either not appropriate or not used correctly	Equipment chosen is neither appropriate to the task nor used correctly
Instructions given are logical in sequence and easy to follow			Instructions given are both logical and easy to follow	Instructions given are confusing and difficult to follow
TOTAL				/max 8

Total: 50 marks