NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2018

LIFE SCIENCES: PAPER III

MARKING GUIDELINES

Time: 1½ hours 50 marks

These marking guidelines are prepared for use by examiners and sub-examiners, all of whom are required to attend a standardisation meeting to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.

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. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.

Part A

Following instructions: four test tubes are labelled 1–4
Procedural skills: appropriate syringe used (5 ml)
Manipulative skills: 1 ml Solution B in syringe

1.13 Table showing the colour changes of different water samples in the presence of Activated Solution A.

Water sample /tube and contents	Colour change
Distilled water (Tube 1)	No change – remained blue-purple
Sample J (Tube 2)	No change – remained blue-purple
Sample K (Tube 3)	From blue-purple to blue-grey
Sample L (Tube 4)	From blue-purple to colourless /became clear

Layout of table (neat with border)

1.14 Control is Test Tube 1 (distilled water). Purpose is to *compare* experimental results with a sample known not to contain cholera/bacteria/ prove that results are owing to cholera or independent variable and not some other variable.

1.15 Any one:
- Amount/volume of Activated Solution A: each tube received 10 ml/same amount of Activated Solution A using a syringe.
- Amount/volume of water sample: each tube contained 15 ml/same amount of water samples using a syringe.

Do not accept – environmental conditions not relevant to this study; size of test tubes is also irrelevant to the validity of this experiment.

1.16 Qualitative. No numbers/measurable data was collected – only colour change (subjective).

1.17 Conclusion: one/two of the samples tested positive for *Vibrio cholerae* (tubes 3 and 4; samples K and L, respectively) as they changed colour (became colourless). Thus Sample K and L are not potable, whereas Sample J is potable.

1.18 Any one of the following:
- Replicates of the water samples could be tested.
- More water samples can be collected from the river (different points along the river/at different times of the year) and tested for *V. cholerae*.
- Filter water for clarity of samples/colour change.
- Rinse kebab stick/stirring rods between samples.

1.19 Lab precaution: any one of the following:
- Wear gloves during testing
- Do not drink the water samples
- Wash hands after handling water samples
- Clean the equipment used for testing with bleach
- Do not discard the samples down the drain

(Accept other suitable safety precautions)

1.20 Sample L → Point A (city)/Point B (village). High populations therefore high amounts of faeces; more human activity; no waterborne sewerage system, sewage therefore washes in river; accept other suitable reasons.

1.21 (a) Any two of the following:
- Number of cases of cholera per week
- Temperature (°C)
- Rainfall (mm)

(b) 13 (*Check final printed version for accuracy*)

(c) The more rainfall there is, the less cholera cases there are

(d) Any two or one well explained:
Boiling (for a certain amount of time to kill pathogens)/addition of bleach (to a concentration of 1m/ℓ)/filtering (filtration using filter paper/other material to remove particulate matter)

1.22 (a) Measurement of scale bar = 5 mm
Measured length of bacterium = 70 mm
5 mm → 0,2 μm
70 mm → X μm (working)
Thus real size = 3 μm / 0,003 mm / 3000 nm / 2,8 μm / 0,0028 mm / 2800 nm
(*must have correct unit*)
OR:
Measurement of scale bar = 5 mm
Measured length of bacterium = 65 mm
5 mm → 0,2 μm
65 mm → X μm (working)
Thus real size = 2,6 μm / 0,0026 mm / 2600 nm
(must have correct unit)
[Acceptable Range: 2,6 μm to 3,0 μm]

(b) Longitudinal

Part B

2.1 Activated Solution A tests positive OR can be used to detect cholera at concentrations less than 100 cells/ml (statement)

2.2 To determine if Activated Solution A can be used to detect cholera at a concentration of lower than 100 cells/ml

2.3 Different concentrations of cholera bacteria, /range of concentrations of cholera/bacteria

2.4 Sample method:

- Label 4 test tubes 1 – 4 using a marker.
- Using a syringe, place 10 ml of cholera/water sample (200 cells/ml) in test tube 1 and 5 ml into test tube 2, 2,5 ml into test tube 3 and 0 ml into test tube 4.
  (*Control independent variable = serial or other dilution*.)
- Rinse syringe.
- Using a syringe, add 5 ml distilled water into test tube 2, 7,5 ml into test tube 3 and 10 ml into test tube 4.
- Rinse syringe.
- Using a dropper, add 10 drops of Activated Solution A into each tube.
- Stir each tube using a kebab stick/glass rod, rinsing the glass rod in between each tube.
- Observe and record colour changes in a table for each concentration.
- Samples that are colourless test positive for cholera.
- Repeat the experiment to verify results. (*This point is not required.*)

Layout: Neat, numbered/listed/bulleted

Aim: Must have cholera samples (at least two concentrations and at least one lower than 100 cells/ml) must use Activated Solution A

Method: Original – look for cholera at different concentrations (if mention Samples J/K/L then no marks awarded).
Equipment – looking for a syringe/equivalent to make a dilution of the bacterial samples; dropper or pipette used for Activated Solution A.
Measuring – equal amounts of Activated Solution A added to each tube; total volumes in test tubes the same.
Valid – dilution done correctly (must have different concentrations, not just different volumes) **and** Activated Solution A added AFTER dilution; appropriate amounts in test tubes.
Measurable results – recording of colour change.

Method Rubric

Method Rubric Criteria	5	4	3	2	1	0
L Layout – appearance of method					Layout meets criteria below: neat and tidy and bulleted/ numbered.	Layout is untidy and hard to read. **OR** Method is not formatted correctly with bullet points or numbers.
A Aim – method relates to prescribed experiment				Method clearly tests an aim that relates to the prescribed experiment and achieves the required result.	Method relates to the prescribed aim given, but is a little confusing and does not achieve the required result.	Method does not relate to the prescribed aim or achieve the desired result. Method given is the same as the given experiment.
M Method – this needs to be appropriate and relevant to the aim, clear, logical and sequential. If apparatus is given in the examination paper, the method should resemble the one given in the marking guidelines.	All 5 criteria given below are met: 1. An original experiment provided. 2. Equipment is appropriate and used correctly. 3. Measuring of solutions, reagents and marking of equipment are explained and this assists in the control of variables. 4. Instructions are scientifically valid and ordered. 5. Instructions are complete to produce measurable results that are recorded.	An original experiment provided. Plus 3 of 5 criteria are met.	An original experiment provided. Plus 2 of 5 criteria are met.	An original experiment provided. Plus 1 of 5 criteria is met.	An original experiment provided.	None of the 5 criteria are met. **OR** Method a copy of the original, given experiment.

Total: 50 marks