NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2011

LIFE SCIENCES: PAPER III

EXAMINATION NUMBER

Time: 1½ hours 50 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. Write your Examination Number in the space provided above.
2. This question paper consists of 8 pages and an Information Sheet of 1 page. Please make sure that your question paper is complete.
3. You have ten minutes to read through this paper before you begin. You are advised to read carefully and spend time planning your work.
4. Perform the tasks with care. You will be assessed on your ability to work independently.
5. Standard time concessions will apply to this examination.
6. Please answer the questions in the spaces provided.
7. The Information Sheet is printed on yellow paper. Please read it carefully before you begin and refer to it during the course of this examination.

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	

The South African Police discovered a small amount of white powder scattered on the ground beside a victim they believe may have been murdered. They have determined that the victim suffered from Type I diabetes and had to inject himself regularly with insulin in order to control his blood sugar level. The victim was found lying on the floor of his bedroom with a gag in his mouth and his hands and feet were bound so that he could not move. In the kitchen of his home they found a new supply of insulin as well as several new syringes and needles.

Is this a case of foul play?

Assume the role of a forensic scientist to determine whether the unknown white powder found next to the dead victim had anything to do with his death.

You will now carry out a short investigation to find out how certain white powders respond when treated with certain chemicals. Before you begin with your investigation, make sure that you have the following equipment at your workstation:

- Three identical test tubes
- Test tube rack
- Table salt
- Cornstarch
- Unknown white powder from crime scene
- Spatula/ice-cream stick
- Cutting tile/petri dish
- Permanent marking pen
- Piece of paper towel
- 5 ml syringe
- Benedict's solution
- Iodine solution
- Dropper pipette/eye-dropper
- 100 ml cold tap water
- Test tube holder

You must also have access to a beaker of boiling water to use as a boiling water bath for your test tubes.

NOTE: Please do not attempt to taste any of the white powdery samples provided to you.

TASKS

1. Place a small amount (spatula tip) of about 1 cm^3 of each white powder into a clean test tube and label with the permanent marker as follows:

   A (table salt)
   B (cornstarch)
   C (unknown white powder from crime scene)

2. Using your syringe, measure 2 ml of water into each of the three test tubes.

3. Shake gently to dissolve the powder if possible.

4. Now, using your syringe, measure 2 ml of Benedict's solution into each tube and shake gently to mix thoroughly.

5. Place your tubes in the hot water bath for at least 5 minutes.

6. While you are waiting for your tubes, place a small amount (spatula tip) of about 1 cm^3 of each white powder onto your tile/petri dish. Make sure that the powder samples remain separated from one another. Use your marking pen to provide labels A, B and C next to each sample.

7. Using your dropper pipette/eye-dropper, place 2 – 3 drops of iodine solution directly on the white powder. Make sure that the iodine does not run between the samples. Observe any change in colour of the iodine solution and make a note of any colour changes that occurred.

8. Using your test tube holder, carefully remove your test tubes from the hot water, place them in your rack and return to your workstation.

9. Observe any colour change in the Benedict's solution or in any precipitate found in the bottom of the tube.

   NOW CALL YOUR TEACHER BEFORE YOU PROCEED ANY FURTHER.

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: (6)
Table: (6)

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

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_____ (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.

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_____ (4)

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

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_____ (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 in 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.

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_____ (3)

14.2 State your aim.

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_____ (2)

14.3 Identify the independent variable.

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_____ (2)

14.4 Identify the dependent variable.

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_____ (2)

14.5 List any THREE controlled/fixed variables and state precisely how they will be controlled in your experiment to ensure fair testing.

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_____ (6)

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

(8)

Total: 50 marks