

NATIONAL SENIOR CERTIFICATE EXAMINATION NOVEMBER 2014

LIFE SCIENCES: PAPER III

EXAMINATION NUMBER						

Time: 1¹/₂ hours

50 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

- 1. Write your examination number in the blocks above.
- 2. This examination paper consists of 8 pages and a yellow Information Sheet. Please check that your question paper is complete.
- 3. You have ten minutes reading time 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 follow instructions.
- 5. Standard time concessions will apply to this examination.
- 6. Please answer the questions in the spaces provided. Should you need more space for answering, use the last page in this question paper only. DO NOT use any additional paper.
- 7. The Information Sheet is printed on separate yellow paper. Please read it **carefully** before you begin and **refer to it during the course of the examination**.

Invigilators are asked to please complete this after the examination.

Criteria		
Following instructions	0	1
Test tube contents	0	1
Manipulation	0	1
TOTAL		3

Procedure							Total

For Markers USE ONLY

Please read the Information Sheet carefully before you start. There are two parts to this question paper: Part 1 – the investigation and Part 2 – experimental design.

You are going to investigate the effectiveness of an enteric coating on the release of aspirin in various pH solutions.

Before you begin your investigation make sure you have the following equipment at your workstation:

- test tube rack
- three identical test tubes
- beaker of distilled water and access to additional tap water for rinsing
- 60 ml solution in a container labelled A
- 60 ml solution in a container labelled B
- 10 ml syringe
- three pieces of red/pink litmus paper and three pieces of blue litmus paper
- an enteric coated aspirin in a container marked 'coated'
- an ordinary aspirin (in foil) in a container marked 'uncoated'
- thermometer
- empty container/beaker
- wooden kebab stick (may need if difficult to use forceps or spatula or teaspoon)
- marking pen
- forceps/spatula/teaspoon
- timer, wall clock is fine
- tissue paper/laboratory paper for wiping equipment
- white tile

PART 1 INVESTIGATION

- 1. Place three clean test tubes in a test tube rack.
- 2. Mark the test tubes A, B and C.
- 3. With a pencil (**not your permanent marker**) clearly mark the red/pink litmus strips A, B and C on the one end of the strip. Similarly mark the blue litmus strips A, B and C.
- 4. Place 40 ml of distilled water into test tube C.
- 5. Using a syringe, transfer 40 ml of solution A into the first test tube A.
- 6. Rinse the syringe. Using the clean syringe, transfer 40 ml of solution B into the second test tube B.
- 7. Record the temperature of the contents of each test tube.
- 8. Test the pH values of the solutions by dipping the unmarked end of the litmus paper in the solution (allow approximately 2 cm of the strip to go into the solution). Put the A strips into test tube A, the B strips into test tube B and the C strips into test tube C.
- 9. Lay the strips out (with markings facing up) on the white tile. **Do not discard.**

10. In the space below construct a suitable table, with an appropriate heading, to record both the temperature readings and the colour changes of litmus that you observed in all three test tubes.

(6)

11. As a result of your investigation to this point, which solution is an acid, which solution is alkaline and which solution is neutral?

 $A = _ B = _$ (2)

CALL THE INVIGILATOR BEFORE PROCEEDING FURTHER

12. Which test tube represents the stomach contents? Explain a reason from your observations.

(3)

Now take the coated and uncoated aspirin (out of foil) and add them to test tube marked A at the same time. Observe carefully what happens for three minutes. Do not stir. Describe your observations below.

(2)

- 14. After three minutes pour out the liquid into an empty cup or beaker. Remove the **coated** aspirin using a spatula or forceps or teaspoon (or kebab stick) and immediately drop it into test tube B. **Do not stir.**
- 15. Leave for 10 minutes. In this time proceed with the rest of the investigation. Observe what happens.
- 16. Describe your observations for step 15 below.

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17. What is the dependent variable in this investigation? (2)18. This investigation simulates a process in the human digestive system. Why is it not necessary to put an uncoated tablet into test tube B? (2)19. Give ONE controlled variable that was important for the fairness/success of this investigation. State clearly how you went about controlling this. (2)In what way does moving the coated tablet from test tube A into test tube B 20. simulate the process occurring naturally in humans? (2)_____ 21. What conclusion did you reach as a result of your investigation? (2)22. Comment fully on why it is valuable and extremely important for scientists to be able to carry out investigations, such as the one described above, that involve using drugs designed for humans use. (3) 23. Describe ONE way in which this investigation could be improved to be a more realistic match of this process in humans.

(2)

24. Below is a section through the small intestine seen under a microscope.

Refer to the Information Sheet to see where this section (marked S) is taken from.



[Adapted from: <http://www.uoguelph.ca/zoology/devobio/210labs/endol.html)>]

Calculate below the actual size in the body of the line marked X - Y on the slide above. Your answer needs to be expressed in mm.

24.1 Measurement with a ruler:

24.2 Calculation of actual size:

25. Identify the type of section shown in the micrograph above.

(1)

[37]

PART 2

EXPERIMENTAL DESIGN

You are to design a completely new experiment.

Helpful Information

There are a number of factors which could affect the rate of release of medication into the body (temperature, surface area and concentration are just some of these). For rapid relief of heartburn (excessive stomach acid) antacids are often taken.

Design a simple experiment where you investigate the effect of surface area of antacid medication in rapidly neutralising excess acid in the stomach.

You could use the following equipment in your design; other equipment available in a school laboratory could also be used.

(Do not actually perform your experiment.)

- distilled water
- test tubes
- an empty ice cream container or similar container
- solid tablets of an antacid, e.g. Rennie, Eno Tums
- a beaker of acid solution (pH 3) similar to stomach acid
- water at a temperature of 40 °C
- pestle and mortar
- spoon
- syringe
- timer
- pH indicator (universal indicator accurately measures a range of pH values) or litmus paper
- 1.1 Formulate a hypothesis for this experiment that you are designing.

1.2 State the aim of the experiment.

(2)

(3)

1.3 Outline your own method using numbered points.

(8)

[13]

ADDITIONAL PAGE