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NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2015

LIFE SCIENCES: PAPER III

EXAMINATION NUMBER

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Time: 1½ hours

50 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. Write your examination number in the blocks above.
2. This question 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 accommodations will apply to this examination.
6. 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)

For Markers USE ONLY

Procedure							Total

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 be investigating the effect of ethanol concentration on the permeability of the cell membrane in beetroot cells.

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

- test tube rack
- five **identical** test tubes
- beaker of 100 ml distilled water
- container of additional tap water for rinsing
- 50 ml concentrated ethanol in a marked container
- 10 ml syringe
- sharp knife
- three cylinders of fresh beetroot in a container of distilled water – from same beetroot
- forceps/spatula
- empty container/beaker
- wooden kebab stick to mix (you may need this if it is difficult to use forceps or spatula)
- marking pen
- wall clock/timer
- absorbent tissue paper/laboratory paper for wiping equipment
- cutting tile or board
- white A4 sheet of paper (NOT to be written on and used for your answers)

PART 1 INVESTIGATION

1. Place five clean test tubes in a test tube rack.
2. Mark each of the five test tubes A, B, C, D and E with the marking pen.
3. Using a syringe, add 20 ml of distilled water to each test tube A, C, D and E (not to B).
4. Using a syringe, add 20 ml of ethanol to each test tube B and C.
5. Using your kebab stick, stir the solution in test tube C.
6. Using a syringe, remove 20 ml of the solution from test tube C and place it in the water in test tube D.
7. Using your kebab stick, stir the solution in test tube D.
8. Remove 20 ml of this solution in test tube D and transfer it to the water in test tube E.
9. Using your kebab stick, mix the solution in E. Now remove 20 ml of this solution and discard into an empty container.

All test tubes now contain different concentrations of ethanol solution.

10. Remove the fresh beetroot cylinders gently from the container of water using the forceps or spatula. Cut five pieces of equal length. Each piece is to measure 10 mm in length. Gently rinse each cylinder after cutting in the beaker of rinse water. Place the cut cylinders on your cutting tile.

NOW CALL THE INVIGILATOR BEFORE PROCEEDING FURTHER

11. Gently place one beetroot cylinder in each of the five test tubes.
12. Wait 20 minutes. While waiting, proceed with the rest of the investigation below.
13. At the end of the 20 minutes, gently stir each solution in the test tubes using your kebab stick. This is to make sure that the colour of the solution is evenly spread out.
14. Remove the cylinders of beetroot gently by piercing them with a kebab stick and taking them out of the test tube. Place each one carefully on the white tile.
15. Complete the table below. Give the table an appropriate heading. **When the investigation is complete**, record your observations in this table. In the table, also record the concentration of ethanol in the test tubes C, D and E.

Heading: _____

(2)

Test tube	Concentration of ethanol (%)	Colour of the ethanol solution in the test tube
A	0	
B	100	
C		
D		
E		

(6)

16. What is the **dependent** variable in this investigation?

(2)

17. What is the **independent** variable in this investigation?

(2)

18. Give ONE controlled variable that was important for the fairness of this investigation.
State clearly how this variable was controlled.

(2)

19. What conclusion can you reach from this investigation?

(2)

20. Why were the cylinders of beetroot cut and rinsed in water before you started your investigation?

(2)

21. Why are the results of this investigation regarded as being **qualitative** in nature?

(2)

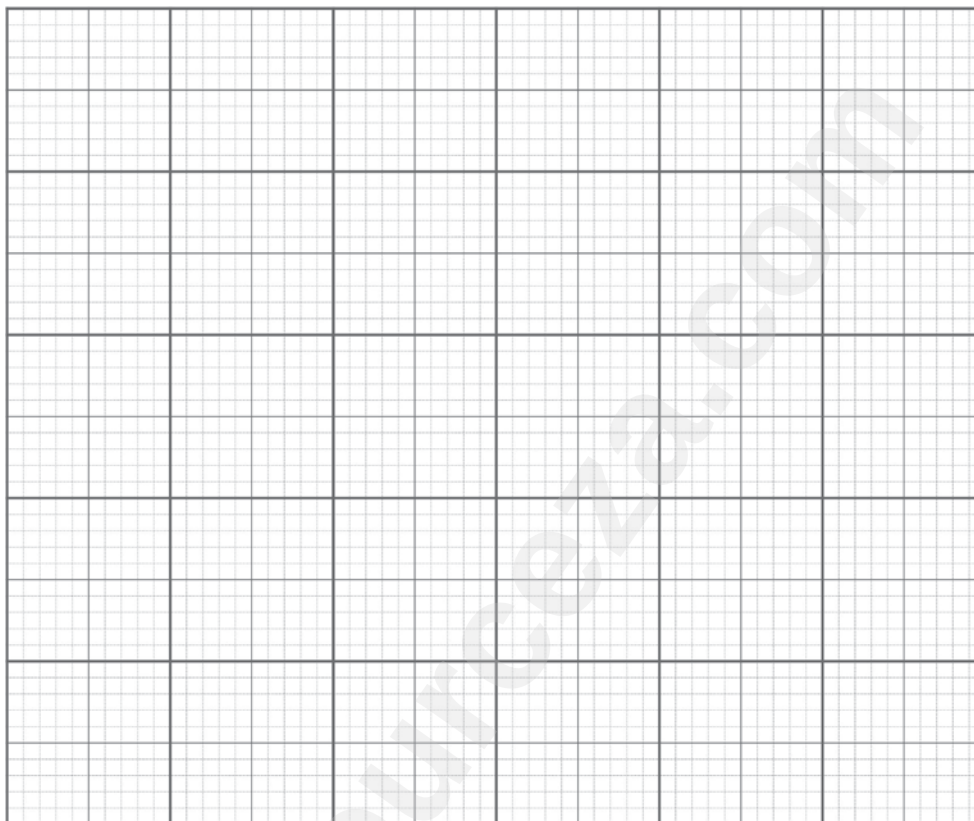
22. A similar investigation using red cabbage AND beetroot was carried out in a laboratory using a spectrophotometer. The readings on the spectrophotometer were recorded and a table of results is given below. REMEMBER TO READ THE INFORMATION SHEET.

Carefully study the data given below. Plot a line graph for both sets of data on the graph paper provided. Your graph needs a suitable heading.

Ethanol in solution (%)	Spectrophotometer reading (% transmission of light)	
	Beetroot	Red cabbage
0	90	95
20	90	95
40	60	70
60	30	40
80	10	20

Heading: _____

(2)



(6)

23. Comment on the results from the data you have plotted.

(2)

24. Extrapolate (extend) the data plotted on the graph to determine the % transmission of light in beetroot for a solution of pure (100%) ethanol. Record your result on the line below.

(2)

25. Assuming the components of the cell membranes and the cell walls are the same in both types of plant, suggest a reason for the possible variation in the results as shown in Question 22.

(2)

PART 2**EXPERIMENTAL DESIGN**

You are to design a completely new experiment.

Design a simple experiment where you now investigate ONE other variable (mentioned in the Information Sheet) and its effect on the permeability of the membranes of beetroot cells. (Do not use a solvent.)

You need to use equipment that would be found in a school laboratory.

(Do not actually perform your experiment).

SOME of the equipment you could include in your design:

- distilled water
- test tubes
- test tube rack
- knife
- fresh beetroot
- beakers
- syringe
- timer
- pH indicator
- thermometer
- stirring rod
- forceps
- cutting tile

1.1 Formulate a hypothesis for this experiment that you are designing.

(3)

1.2 State the aim of the experiment.

(2)

[illegible]

(8)

PLEASE TURN OVER

ADDITIONAL PAGE (if needed)[illegible]