Centre Number	Candidate Number	Candidate Name

NAMIBIA SENIOR SECONDARY CERTIFICATE

BIOLOGY HIGHER LEVEL

8321/3

PAPER 3 Practical Test

1 hour 30 minutes

Marks 40

2019

Additional Materials: As listed in Instructions to subject teachers.

INSTRUCTIONS AND INFORMATION TO CANDIDATES

- Candidates answer on the question paper in the spaces provided.
- Write your Centre Number, Candidate Number and Name in the spaces at the top of this page.
- Write in dark blue or black pen.
- You may use a soft pencil for any rough work, diagrams or graphs.
- Do not use correction fluid.
- You may use a non-programmable calculator.
- Do not write in the margin *For Examiner's Use*.
- Answer **all** questions.
- The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
Total	

Marker	
Checker	

This document consists of **7** printed pages and **1** blank page.

Republic of Namibia

MINISTRY OF EDUCATION, ARTS AND CULTURE

You have 45 minutes for each question in the practical examination. Read carefully through both questions. Plan your time to ensure that you finish all the work you would like to do.

1 The experiment you are about to perform shows how organic waste is broken down by microorganisms. As microorganisms clean the water of waste they require oxygen. The rate at which the oxygen is used up is referred to as the biological oxygen demand. A high biological oxygen demand indicates a high amount of organic waste material in the water.

In this experiment milk acts as the waste material and yeast is the microorganism that breaks it down. Methylene blue is used as an indicator for oxygen. The blue colour of methylene blue disappears as the oxygen concentration drops.

Procedure:

1 Place a thermometer in the beaker labelled "water bath" and heat the water to a temperature of about 45ºC.

2 While the water is warming up, label the four test-tubes **A**, **B**, **C** and **D**.

3 Prepare the test-tubes as follows:

To test-tube **A** add 3 cm^3 of water and 2 drops of methylene blue

To test-tube **B** add 3 cm^3 of solution **Y** and 2 drops of methylene blue

To test-tube **C** add 3 cm^3 of solution **X** and 2 drops of methylene blue

To test-tube **D** add 3 cm^3 of solution **X** and 2 drops of methylene blue

Table 1.1

test-tube	time yeast is added	time of colour change	time taken for colour change (s)	colour after 6 minutes
A	0:00			
B	0:30			
C	1:00			
D	1:30			

4 Place test-tubes **A**, **B** and **C** in the 45ºC water bath.

5 Add 20 cm^3 of tap water to the beaker labelled "yeast" and stir the mixture gently using the stirring rod.

6 Add 2 cm^3 of the yeast solution to test-tube **A**. Mix gently using the stirring rod and start the stop watch.

7 After 30 seconds add 2 cm^3 of the yeast solution to test-tube **B**. Mix gently using the stirring rod.

8 After 60 seconds add 2 cm^3 of the yeast solution to test-tube **C**. Mix gently using the stirring rod.

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9 After 90 seconds add 2 cm^3 of the yeast solution to test-tube **D**. Mix gently using the stirring rod.

10 In Table 1.1 record the time at which the content of each test-tube becomes white. Continue with your observations for a maximum of 6 minutes after the last yeast was put in. Note: a blue ring may remain at the top.

(a) Complete Table 1.1 by calculating how long it took for the content of each test-tube to change colour. [3]

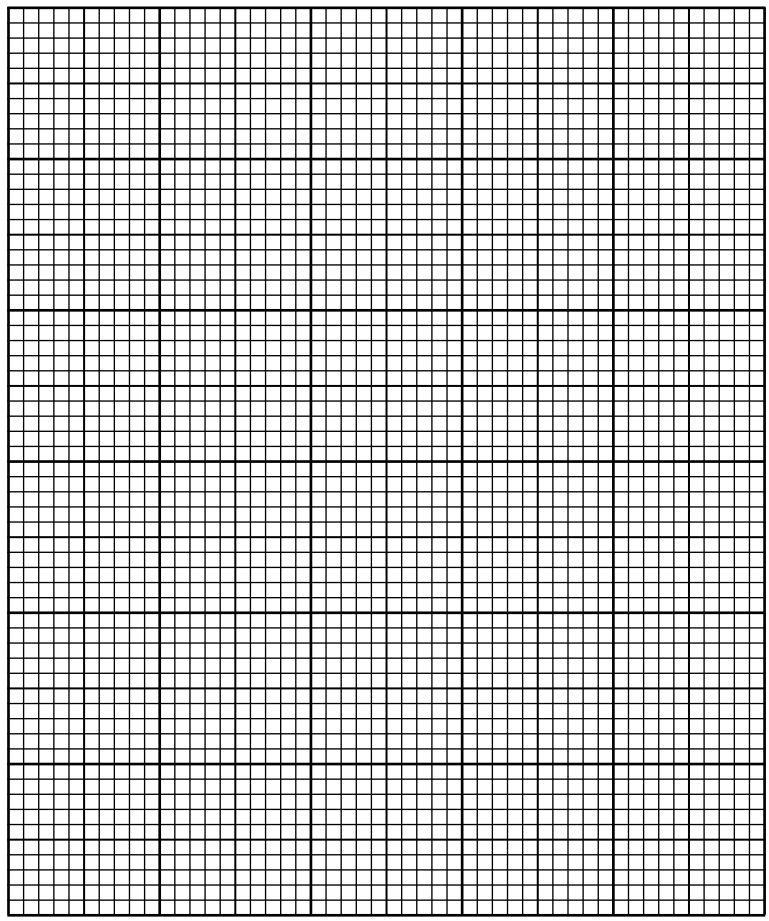
(b) Name the gas that is released by the yeast during the reaction.

..... [1]

(c) Name the process by which microorganisms break down the biodegradable waste in the water.

..... [1]

(d) **(i)** On the graph paper below draw a bar graph of the time taken for the colour change in the test-tubes **A**, **B**, **C** and **D**.



[4]

(ii) With reference to the graph, suggest which of the solutions, **X** or **Y**, contains the highest amount of waste material. Explain your answer.

.....

..... [1]

(e) (i) Temperature is responsible for the difference in results between test-tubes **C** and **D**.

Discuss how temperature affects the oxygen demand of the microorganism.

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..... [4]

(ii) Power plants use water to cool their machinery. This water contains no chemicals and is poured directly into rivers.

Describe the effect that this process might have on the water and the effect that this may have on the organisms living there.

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..... [2]

(f) Each of the test-tubes contains an environment in which the yeast can live.

(i) What happens to the size of the population of yeast in the test-tubes?

..... [1]

(ii) Using your answer to **(f) (i)** suggest what will happen in a river if organic nutrients are poured into it.

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..... [3]

[20]

2 **(a)** You have been provided with a kidney bean seed **(R)** and a lentil seed **(S)**.

(i) One of the seed types contains 9.3 g of protein per 100 g and the other seed contains 12.0 g of protein per 100 g. Carry out a suitable food test on the two different seeds to determine which seed contains more protein, and then use the results of this experiment to complete Table 2.1.

Table 2.1

	nutritional facts per 100 g	
	kidney beans	**brown lentils**
energy (kJ)	490	512
total fat (g)	0.8	0.8
cholesterol (mg)	0.0	0.0
sodium (mg)	2.0	4.0
fibre (g)	10.1	9.2
carbohydrate (g)	13.0	13.0
protein (g)	.....	.....

[1]

(ii) Describe how to carry out the test for protein. Include the results for each seed type and what these two results indicate.

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..... [4]

(b) State what needs to be done in this experiment to ensure the results for the two seed types were comparable and valid.

..... [1]

(c) (i) Both beans and lentils are legumes. Use the information in Table 2.1 to calculate the amount of fat a person consumes when eating 150 g of either legume in a meal. Show your working.

.....g [2]

(ii) Suggest, using evidence from Table 2.1, why these legumes may not contribute to heart disease.

..... [1]

(d) Fig. 2.1 shows an artery and a vein.

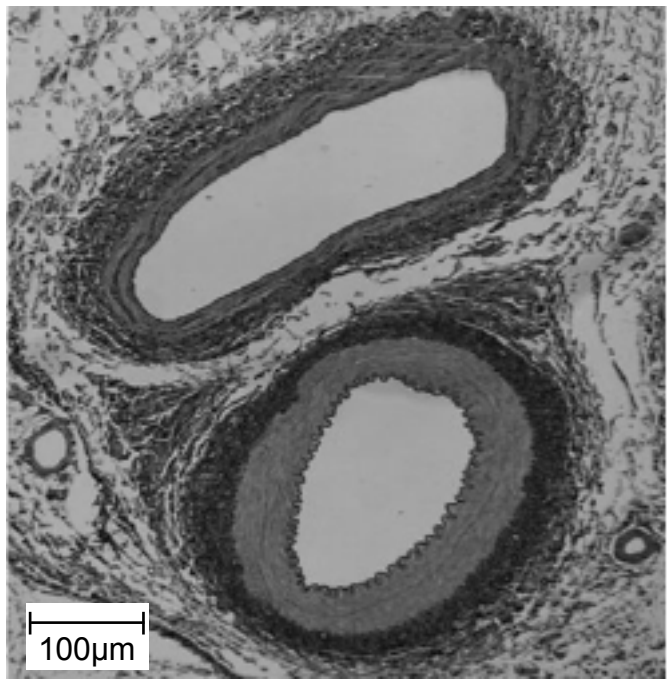

Fig. 2.1

(i) In the space below draw a **plan diagram** of the artery in Fig. 2.1.

[4]

(ii) Calculate the magnification of the micrograph in Fig. 2.1. Show your working.

..... [3]

(iii) In the space below construct a table to list three visible differences between the artery and the vein in Fig. 2.1. Explain how each difference enables the artery to maintain circulation.

[4]

[20]

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