Centre Number	Candidate Number	Candidate Name

NAMIBIA SENIOR SECONDARY CERTIFICATE

BIOLOGY ADVANCED SUBSIDIARY LEVEL 8223/3

PAPER 3 Advanced Practical Skills — 2 hours

Marks 40 — **2022**

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 **10** printed pages and **2** blank pages.

Republic of Namibia

MINISTRY OF EDUCATION, ARTS AND CULTURE

Before you proceed, read carefully through the **whole** of Question 1 and Question 2.

Plan the use of the **two hours** to make sure that you finish the whole of Question 1 and Question 2.

Take note that for the first question warm water (40°C – 45°C) is needed. You can request more hot water from the invigilator if required. Plan your time carefully – you should not spend more that 1 hour in this question.

1 During anaerobic respiration, yeast breaks down glucose to ethanol and carbon dioxide. The carbon dioxide dissolves in water to form an acidic solution.

You are required to investigate the effect that different concentrations of glucose solutions have on the activity of yeast cells, by measuring the change in pH with the help of Universal Indicator solution.

You are provided with:

- 6 test-tubes
- 30 cm^3 of 10% glucose solution in the beaker labelled **beaker 1-glucose solution**
- 4 beakers labelled beaker 2, beaker 3, beaker 4 and beaker 5
- 100 cm^3 of distilled water
- 0.5 g of dried yeast which is labelled **dried yeast**
- Dropper bottle with 'Universal Indicator solution'
- Five glass rods labelled **A**, **B**, **C**, **D** and **E** and one non-labelled stirring rod

Before starting the investigation, label the test-tubes **A**, **B**, **C**, **D**, **E** and **F**. Use the Universal Indicator solution to determine the starting pH of the glucose solution by placing 5 cm^3 of glucose solution from **beaker 1** into test-tube **F** and adding 5 drops of the Universal indicator solution.

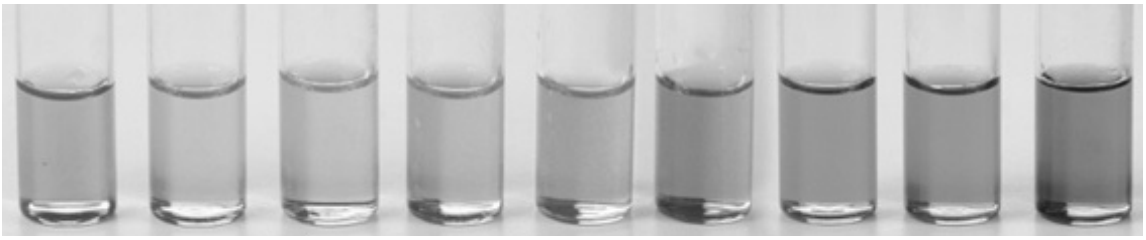

Fig. 1.1

For Examiner's Use

(a) (i) Use the colour chart in Fig. 1.1 to determine the pH starting of the glucose solution.

starting pH of glucose is ..... [1]

(ii) Make the different concentrations of glucose solutions **A** - **E** using the following procedure. Keep washing the 5 cm^3 syringe used to transfer the glucose solution after every use.

Step 1: Add 5 cm^3 of 10% glucose solution from **beaker 1** into **test-tube A**.

Step 2: Add 1 cm^3 of the glucose solution from **beaker 1** into **beaker 2** and add 9 cm^3 of distilled water and shake thoroughly.

Step 3: Add 5 cm^3 of glucose solution from **beaker 2** into **test-tube B**.

Step 4: Add 1 cm^3 of glucose solution from **beaker 2** into **beaker 3** and add 9 cm^3 of distilled water and shake thoroughly.

Step 5: Add 5 cm^3 of glucose solution from **beaker 3** into **test-tube C**.

Step 6: Add 1 cm^3 of glucose solution from **beaker 3** into **beaker 4** and add 9 cm^3 of distilled water and shake thoroughly.

Step 7: Add 5 cm^3 of glucose solution from **beaker 4** into **test-tube D**.

Step 8: Add 1 cm^3 of glucose solution from **beaker 4** into **beaker 5** and add 9 cm^3 of distilled water and shake thoroughly.

Step 9: Add 5 cm^3 of glucose solution from **beaker 5** into **test-tube E**.

Complete Table 1.1.

Table 1.1

beaker	**volume of glucose solution added/ cm^3**	**volume of distilled water added/ cm^3**	**percentage concentration of glucose**
1	10	0	10
2			
3			
4			
5			

[3]

For Examiner's Use

Read through the procedure below before starting the investigation that follows and c**onstruct a suitable table** at question **1(a)(iii)**.

1 Use the beaker labelled "water-bath" to prepare a water-bath with 150 cm^3 a temperature of 40 – 45°C.

2 Add 5 drops of Universal Indicator solution from the dropper bottle to each test-tube labelled **A** – **E**. Record the pH of each solution in your prepared table.

3 Place the five test-tubes in the water-bath for 5 minutes.

4 During this 5 minutes, add 25 cm^3 of warm water from the water-bath to the yeast provided using a clean syringe. Mix the solution thoroughly using the non-labelled stirring rod.

5 At the end of 5 minutes, add 0.5 cm^3 of the yeast solution to each of the test-tubes in the water bath and stir each mixture with the correctly labelled stirring rod.

6 Start the stop watch.

7 After 3 minutes stir each solution.

8 After 10 minutes, remove the test-tubes from the water-bath and record the colour and pH of each solution in your table drawn below in question **1(a)(iii)**. During this 10 minutes, you could continue with part **(b)** while waiting for the results.

(iii) Construct a suitable table for your results in the space below.

[4]

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(b) (i) Suggest why the test-tubes were left in the water-bath for 5 minutes in step 3.

.....

..... [1]

(ii) Identify a potential source of inaccuracy that could occur during this investigation.

.....

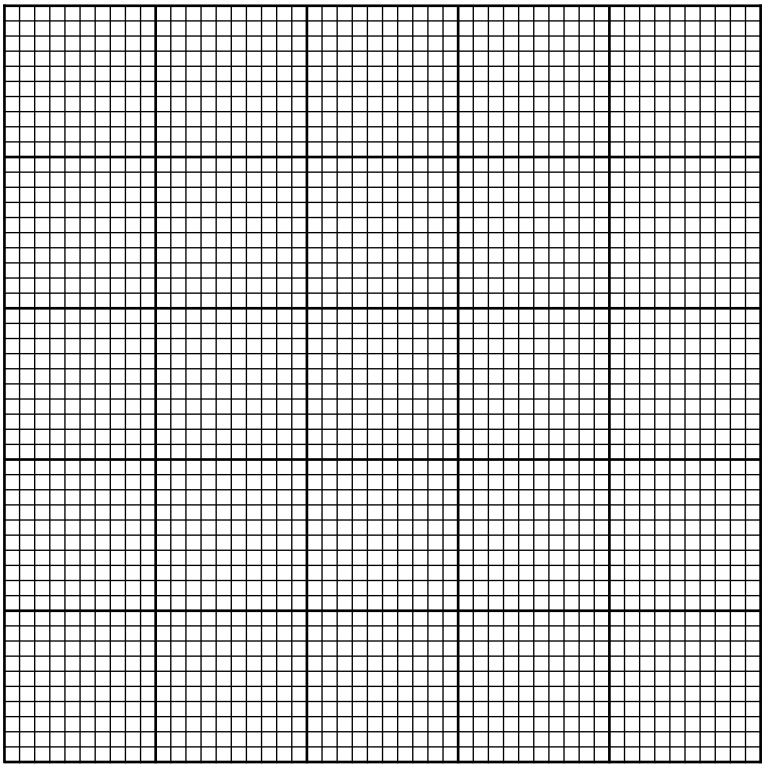
..... [1]

Red hydrogen-carbonate indicator can be used to indicate the rate of anaerobic respiration in yeast. As yeast respires it produces carbon dioxide which turns the red hydrogen-carbonate indicator yellow. The concentration of glucose and yeast remained constant during the investigation. A student investigated the effect of changing the temperature on respiration in yeast by recording the time taken for the same volume of hydrogen-carbonate indicator to turn yellow when mixed with a yeast and glucose solution at different temperatures. The results of the investigation are shown in Table 1.2.

Table 1.2

Temperature / °C	Time taken for hydrogen-carbonate indicator to turn yellow/ s
15	72
25	54
30	43
35	31
45	13

(c) (i) Plot a suitable graph using the data shown in Table 1.2.



[4]

For Examiner's Use

(ii) Use the graph to estimate the enzyme activity at 42°C.

..... [1]

(iii) Use data from the graph to describe and explain how the temperature affects the rate of enzyme activity.

.....

.....

.....

.....

.....

..... [4]

(iv) To ensure that the investigation is successful, the student has to ensure that the results are as accurate and reliable as possible. Suggest how the student can ensure

accuracy.....

.....

reliability. .....

..... [2]

[21]

For Examiner's Use

2 You are provided with a microscope slide, showing a transverse section through the leaf of a dicotyledonous plant.

(a) (i) In the space below, draw a labelled plan diagram of the leaf.
Label any **two** tissues **other than** xylem and phloem.

[5]

(ii) Look for the vascular bundle of the leaf on the slide.

Each scale division on the stage micrometer = 0.1mm

Count the number of the eyepiece graticule units across the lumen of the xylem vessel.

Number of eyepiece graticule units .....

Count the number of eyepiece graticule units that match an exact number of stage micrometer scale divisions.

number of eyepiece graticule units .....

number of stage micrometer scale divisions .....

Use this information to calculate the actual width of the lumen of the xylem in micrometers. Show your working.

Actual width of the lumen of the xylem vessel ..... µm [4]

(iii) Suggest how an error in measuring the width of the lumen a xylem vessel could occur.

.....

..... [1]

(b) Fig. 2.1 shows a longitudinal section through xylem tissue. Fig. 2.2 shows a longitudinal section through phloem tissue.

Fig. 2.1

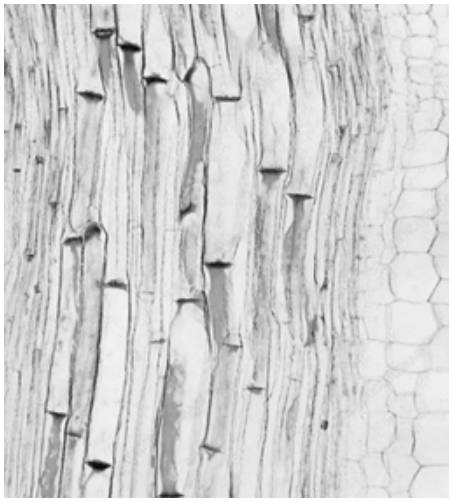


Fig. 2.2

(i) Prepare a table in the space below so that it is suitable to compare the tissues shown in Fig. 2.1 and Fig. 2.2 and then record your observations.

[4]

(ii) Both the tissues shown in Fig. 2.1 and Fig. 2.2 are responsible for performing the same type of function. State which observation relates to this function.

.....

..... [1]

(c) Fig. 2.3 shows a cross-section through the leaf from a xerophyte.

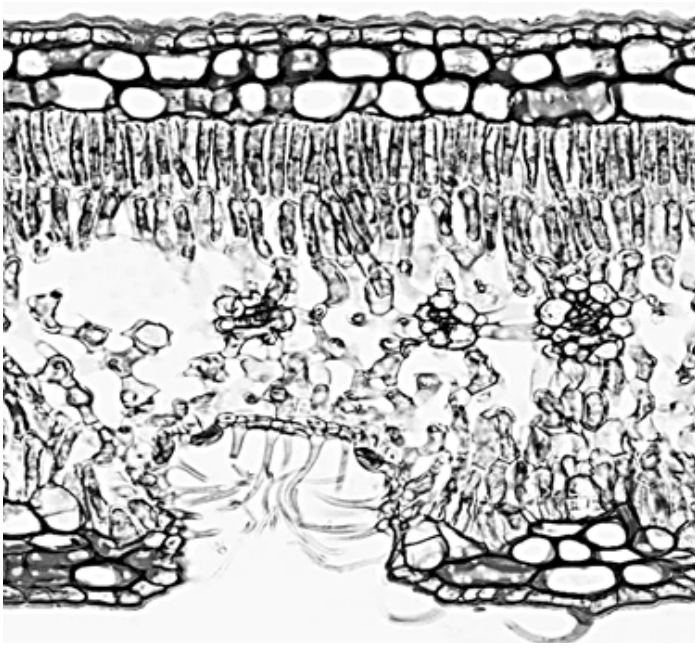


Fig. 2.3

State **two visible features** which indicate that the leaf is from a xerophyte and explain how they help to reduce transpiration.

1 .....

.....

.....

.....

2 .....

.....

.....

..... [4]

[19]

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