Centre Number	Candidate Number	Candidate Name

NAMIBIA SENIOR SECONDARY CERTIFICATE

BIOLOGY ORDINARY LEVEL

4322/3

PAPER 3 Applied Practical Skills

2 hours

Marks 60

2020

Additional Material: Ruler

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 diagrams, graphs or rough working.
- 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	
3	
4	
5	
Total	

Marker	
Checker	

This document consists of **16** printed pages.

Republic of Namibia

MINISTRY OF EDUCATION, ARTS AND CULTURE

1 (a) Define *enzymes*.

.....

..... [1]

(b) State what is meant by optimum temperature of an enzyme.

.....

..... [1]

(c) Catalase is an enzyme which breaks down hydrogen peroxide. Hydrogen peroxide is a common waste product in plant and animal cells.

Catalase breaks down hydrogen peroxide:

hydrogen peroxide $\xrightarrow{\text{catalase}}$ water + oxygen

If a tissue containing catalase is added to hydrogen peroxide in a test-tube, oxygen is produced and foam develops in the test-tube as shown in Fig. 1.1. The height of the foam can be measured and used as an indication of catalase activity.

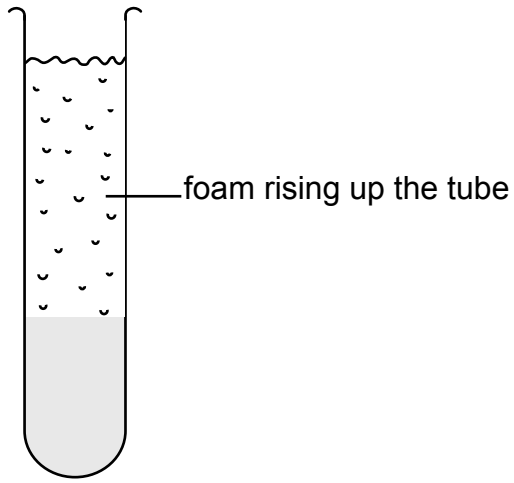


Fig. 1.1

In an investigation, the effect of temperature on the catalase enzyme was examined using the following procedure:

- Four test-tubes were set up with 5 cm^3 of hydrogen peroxide. Each was brought to a different temperature: 7°C, 20°C,37°C and 100°C respectively.
- A liver cube of 1 cm^3 was added to each test-tube.
- The height of foam produced to each test-tube was measured after 30 seconds.

(i) Table 1.1 shows different variables. Complete the table using a tick (✓) to identify the variables that should be kept the same to ensure the investigation was valid.

Table. 1.1

Variable	**Variable kept the same?**
concentration of enzyme	
concentration of substrate at start	
pH	
temperature	
total volume of substrate in the test-tube	

[2]

(ii) Identify the substrate in this investigation.

..... [1]

(iii) Suggest and explain the effect on the height of the foam if the cubes of liver were cut into smaller slices.

.....

.....

.....

..... [2]

(iv) How could the investigation be modified to provide more accurate results?

.....

.....

.....

..... [2]

For Examiner's Use

(v) Prepare a table in the space below that could be used to record the results of the investigation. Leave any cells blank where data is not yet known.

[3]

[12]

2 Blackcurrants shown in Fig. 2.1 are small, round edible black berries. Blackcurrants can be ground up into juice containing sugar.

Fig. 2.1

In an experiment, learners measured the change of mass of potato cylinders in different concentrations of blackcurrant juice. They set up 6 test-tubes, each containing 30 cm^3 of different concentrations of blackcurrant juice.

Table 2.1 shows the volume of blackcurrant juice and distilled water needed to make 10 cm^3 of the different concentrations of blackcurrant juice.

Table. 2.1

Percentage concentration of blackcurrant juice	Volume of blackcurrant juice/cm^3	Volume of distilled water/cm^3
0	0	10
20		
40	4	6
60		4
80	8	
100	10	0

(a) Complete Table 2.1 to show how to make 30 cm^3 of different concentration of blackcurrant juice. [2]

The learners cut cylinders from the same potato and trimmed the potato cylinders to the same length. The learners blotted the potato cylinders dry with a paper towel and weighed each one separately.

One potato cylinder was placed into each of six different concentrations of blackcurrant juice as shown in Fig. 2.2.

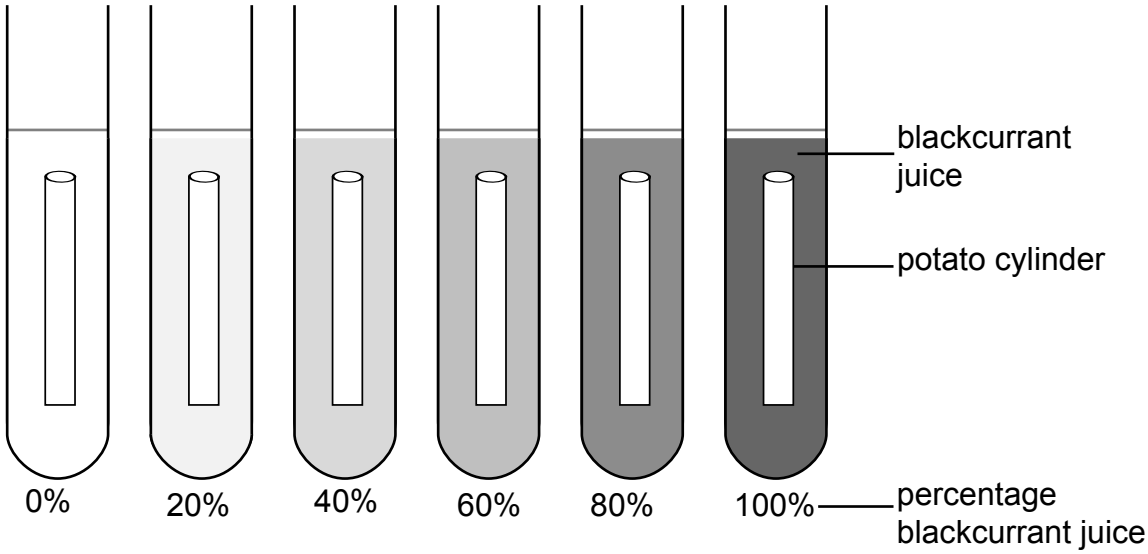


Fig. 2.2

After 30 minutes the learners removed each cylinder and blotted it dry. Each cylinder was reweighed and the mass recorded. Table 2.2 shows their results.

Table 2.2

Percentage concentration of blackcurrant juice	Mass of cylinder at start/g	Mass of cylinder after 30 minutes/g	Change in mass/g	Percentage change in mass
0	8.2	9.15	+0.95	11.59
20	8.9	8.92	+0.02	0.22
40	9.0	8.14	-0.86	-9.56
60	8.5	8.00	-0.50	-5.88
80	8.0	4.50	-3.50	-43.73
100	8.95	4.00		

(b) Calculate the change in mass and the percentage change in mass of the potato cylinders in the 100% concentration of blackcurrant juice.
Record these values in Table 2.2. [1]

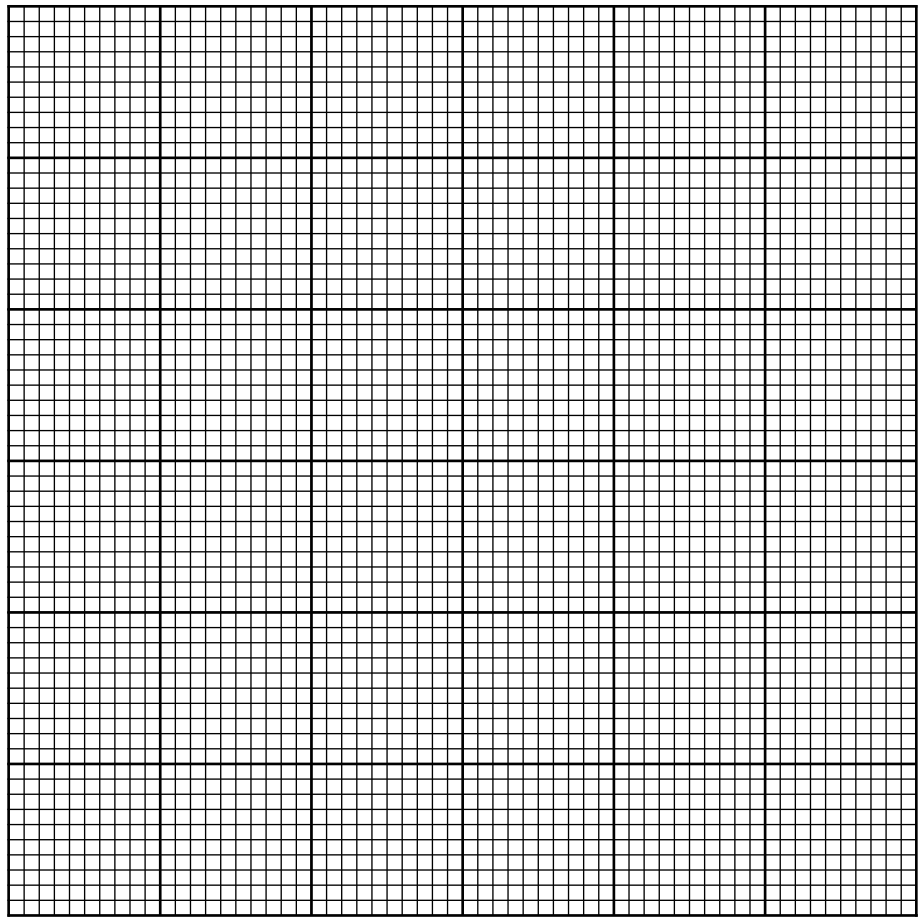
For Examiner's Use

(c) The learners cut cylinders from the same potato. Suggest **one** reason why it was important to use the same potato.

.....

..... [1]

(d) Use the data in Table 2.2 to plot an appropriate graph of percentage change in mass against concentration of blackcurrant juice on the grid provided.



[5]

(e) Suggest the reason for the changes in mass of the potato cylinders between the concentrations of 0% and 80% blackcurrant juice.

.....

.....

.....

.....

.....

..... [3]

[12]

3 (a) (i) Describe *mitosis.*

.....

..... [1]

(ii) Outline the purpose of meiosis and mitosis in the human body.

Meiosis: .....

Mitosis: ..... [2]

(b) The root tip squash procedure can be used to observe cells undergoing mitosis.

(i) Complete Fig. 3.1 which describes the stages involved in preparing a root tip squash to show mitosis. Write the most appropriate word or words on the dotted lines.

Stage 1

Carefully remove the root tip from an onion that has been grown in water.

↓

Stage 2

Place the root tip in .....acid, which will ..... the tissue.

↓

Stage 3

Rinse in distilled water and then add a few drops of a stain such as .....

↓

Stage 4

To prepare to view in a light microscope, place the stained root tip on a ..... and then place a ..... on top.

Fig. 3.1

[3]

(ii) Suggest why the root tip is a suitable part of the onion plant for the observation of mitosis.

.....

..... [1]

(c) Fig. 3.2 shows an onion root tip cell before mitosis starts.

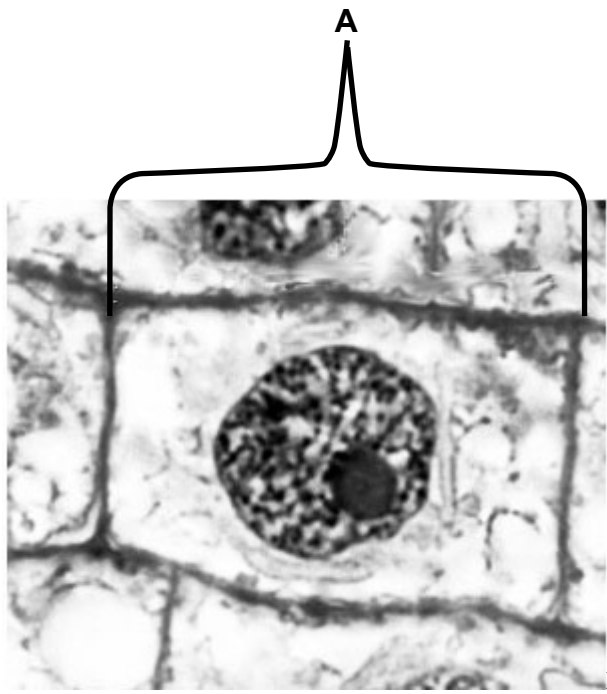


Fig.3.2

(i) Use label lines to identify the cell wall, cytoplasm and nucleus on Fig. 3.2. [3]

(ii) Use a ruler to measure the length of the cell labelled **A** in Fig. 3.2.

..... [1]

(iii) Calculate the actual length of the cell labelled **A**. Show your working and give your answer in millimetres (mm) and micrometers (μm).

…….. mm

……. (μm). [2]

[13]

4 (a) Fig. 4.1 shows some of the apparatus used in various organic food tests.

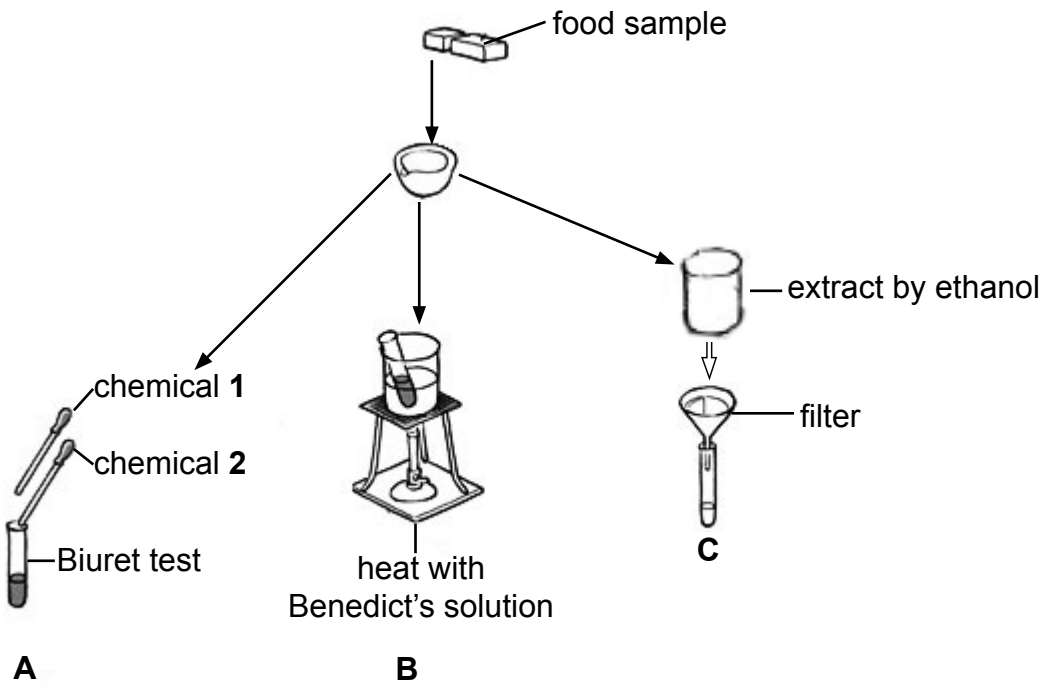


Fig. 4.1

(i) Name the nutrients tested for in each of the experiments labelled **A**, **B**, and **C**.

A .....

B .....

C ..... [3]

(ii) Identify the chemicals numbered **1** and **2**.

1 .....

2 ..... [2]

(iii) State the observation that would indicate a positive reaction in each of the test tubes used in the experiments labelled **A**, **B** and **C**.

A .....

B .....

C ..... [3]

(b) Fig. 4.2 shows the percentage of carbohydrates, fats, proteins and water in eight types of foods.

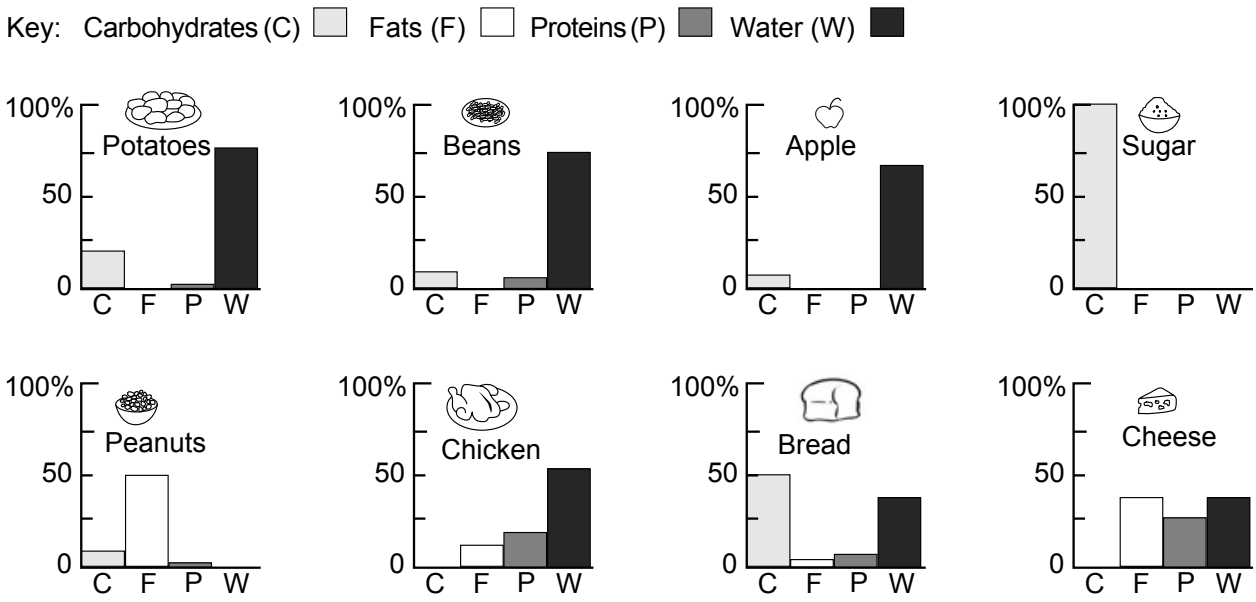


Fig. 4.2

From the information provided in the bar charts above, name two types of food that

(i) contain more than 25% of a nutrient which is used in the formation of an insulating layer in the body,

..... and ..... [1]

(ii) would help to build muscle in the body,

..... and ..... [1]

(iii) will form only monosaccharides and amino acids after digestion.

..... and ..... [1]

[11]

5 Human activities that have negative effects on the environment need to be managed and monitored.

(a) Fig. 5.1 shows how water pollution by sewage in a small lake affected the Biological Oxygen Demand (BOD) in the water over a period of time.

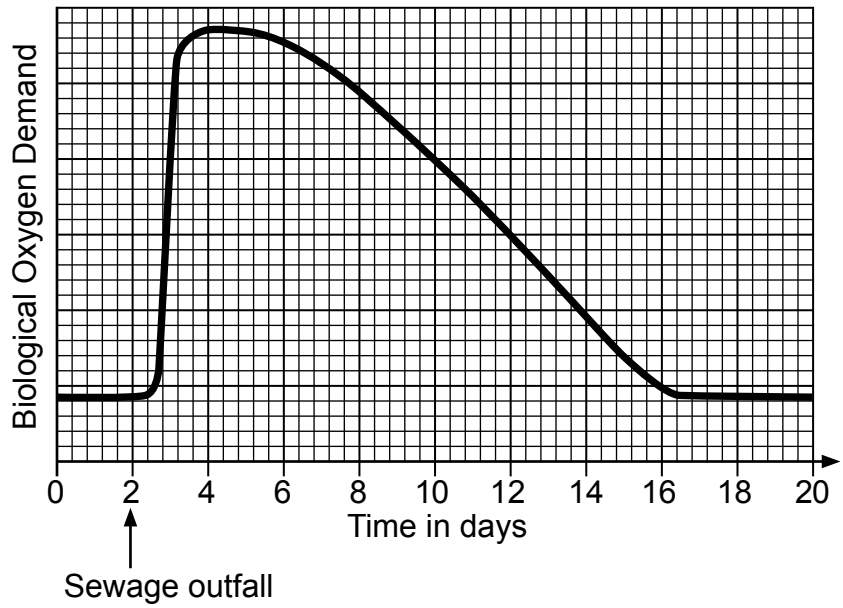


Fig. 5.1

(i) Briefly outline how you would compare the BOD in water from before and after sewage outfall, using methylene blue as an indicator.

.....

.....

.....

.....

.....

..... [3]

(ii) Suggest an explanation for the effect of the sewage pollution on BOD in the lake as shown in Fig. 5.1.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) Table 5.1 shows different qualities of water in a stream and the types of invertebrates present.

Table 5.1

Quality of water	The main type of invertebrates present
Clean with no pollution	Mayfly
Low pollution	Freshwater shrimp
Medium pollution	Blood worm
High pollution	Rat-tailed maggot

A student recorded the number of each of these types of invertebrates in samples of water taken above and below a point where highly polluted water was washed into a stream.

Fig 5.2 shows the results of the study for two types of invertebrate.

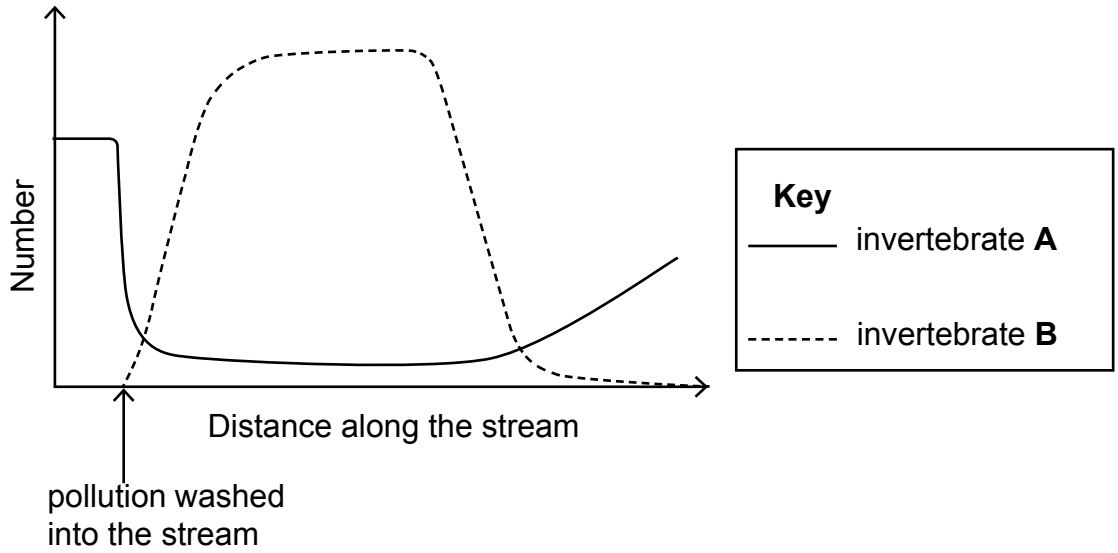


Fig. 5.2

(i) State what is meant by invertebrate.

..... [1]

(ii) Describe what is meant by *biodiversity*.

..... [1]

In part **(iii)** and **(iv)**, use the Table 5.1 and Fig. 5.2.

(iii) Which type of invertebrate would you expect to be the most abundant up to the point where the polluted water was washed into the stream?

..... [1]

(iv) Identify invertebrate **B** on Fig. 5.2.

..... [1]

(v) Suggest a reason rat-tailed maggots are not found in the clean water.

.....

..... [1]

[12]