Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

5643531812

BIOLOGY **9700/52**

Paper 5 Planning, Analysis and Evaluation **October/November 2021**

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 30.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages.

1 Some students researched how yeast, *Saccharomyces cerevisiae*, is used in the food industry. The students found that in different manufacturing processes yeast is provided with different types of sugar. These sugars are either monosaccharides or disaccharides.

The students decided to compare the effect of supplying yeast with glucose or with maltose.

Glucose is a monosaccharide. Maltose is a disaccharide composed of two glucose molecules joined by a glycosidic bond.

- The students made a standard yeast suspension using 100 g of dried yeast and 1 dm^3 of deionised water.
- The suspension was left at 20 °C for two hours. During this time the yeast became active.
- After two hours the yeast culture was divided into two samples.
- Sample **A** was provided with glucose and sample **B** was provided with maltose.
- The apparatus shown in Fig. 1.1 was set up for each sample separately.

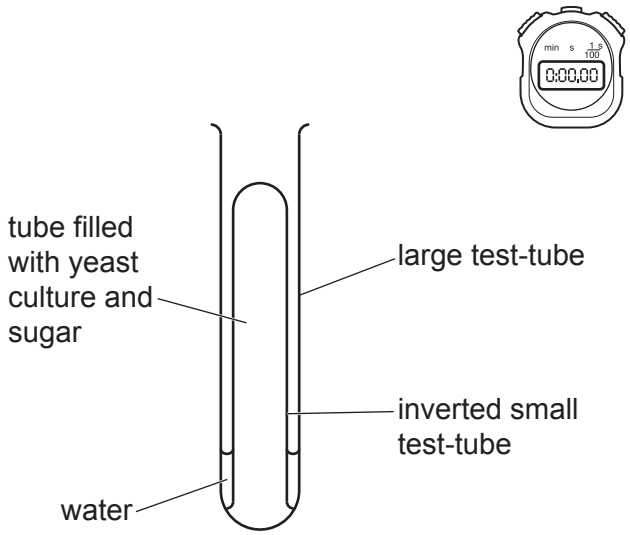

Fig. 1.1

- As the yeast respired, gas collected at the top of the small test-tubes, as shown in Fig. 1.2.

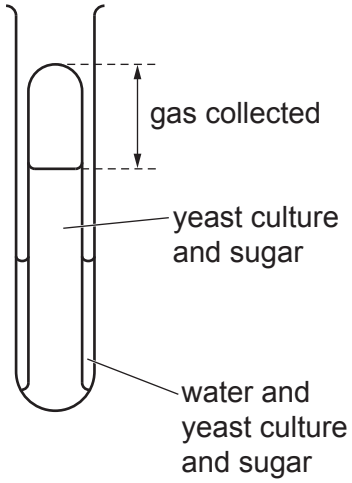

Fig. 1.2

The students used the apparatus to test the hypothesis:

Yeast has a higher rate of respiration when supplied with glucose than when supplied with maltose.

(a) (i) State the independent variable **and** the dependent variable in this investigation.

independent variable .....

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dependent variable .....

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[2]

(ii) The students stirred the yeast suspension before dividing it into the two samples.

Explain why it is important to stir the suspension.

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..... [1]

(iii) Describe a method using the apparatus set up as shown in Fig. 1.1 that the students could use to test their hypothesis.

Your method should be set out in a logical order and be detailed enough for another person to follow.

You should **not** include details of how to make the yeast suspension or how to set up the apparatus.

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Question 1 continues on page 6.

(b) Other students used a gas syringe to measure the volume of gas produced when a suspension of yeast was supplied with glucose or maltose.

Fig. 1.3 shows their results.

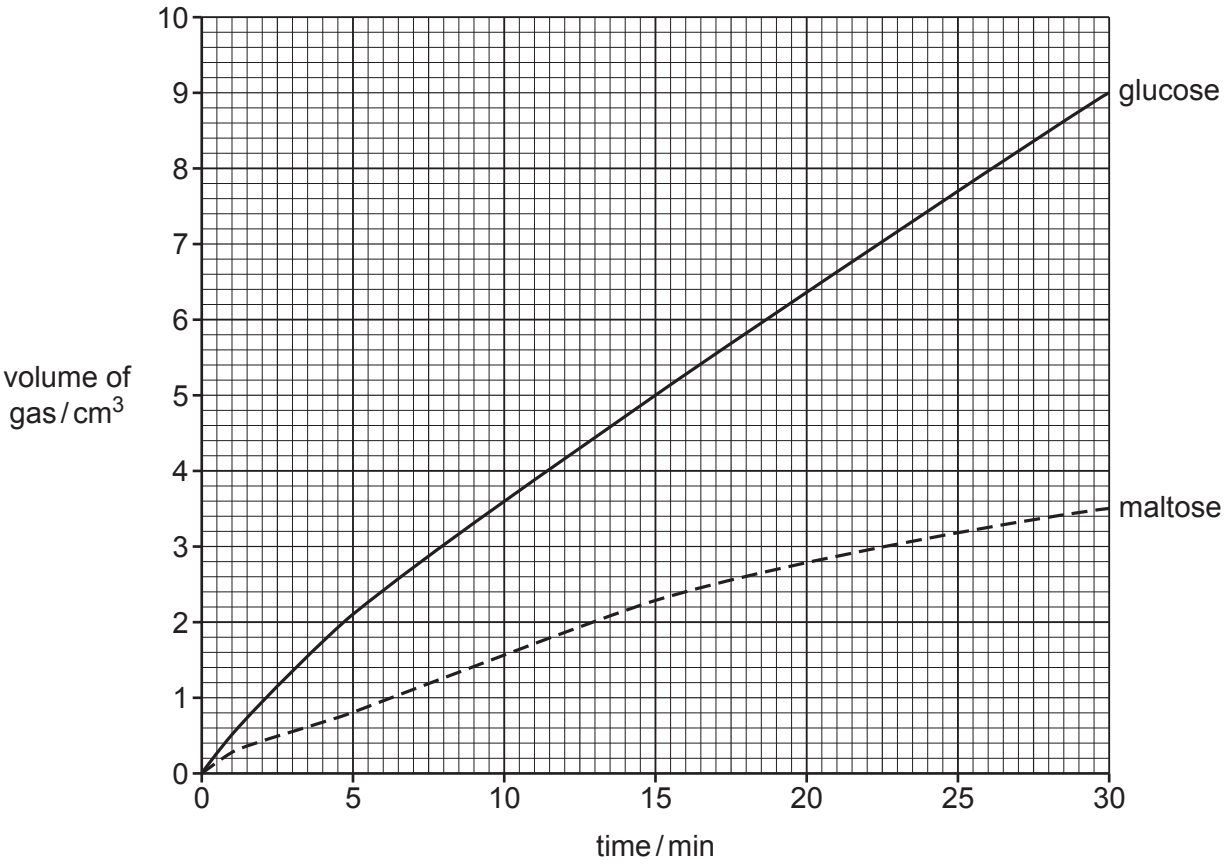

Fig. 1.3

(i) State how the students could calculate the rate of respiration from the results shown in Fig. 1.3.

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(ii) State **and** explain the conclusions that can be made for the results in Fig. 1.3.

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(c) When the students evaluated their method they thought that they could measure the change in pH in the yeast suspension as the gas produced by yeast is carbon dioxide.

One student suggested using an indicator solution and colour chart. Another student suggested using a pH meter.

Suggest the advantages of using a pH meter rather than an indicator solution and colour chart.

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[Total: 17]

2 Fig. 2.1 shows a gray tree frog, *Dryophytes versicolor*.

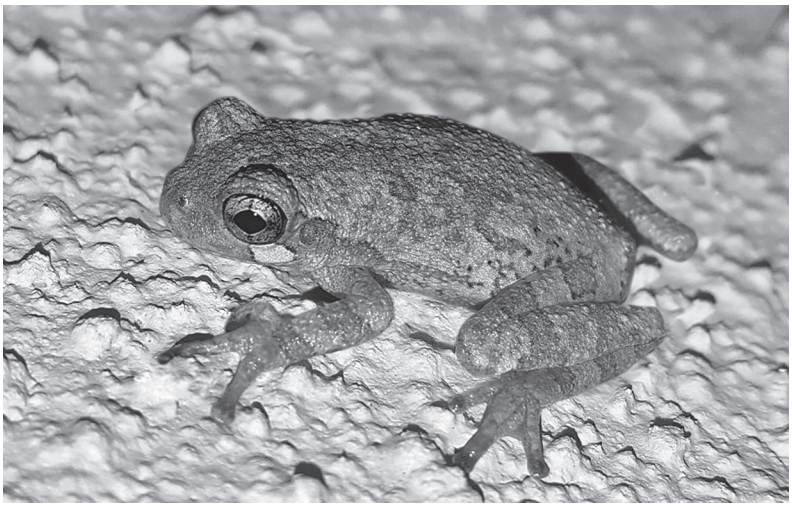

Fig. 2.1

Males of this species make a very distinctive mating call.

Some male gray tree frogs were kept in the laboratory at different temperatures. Their mating calls were recorded. Each call consists of a number of pulses. The calls are repeated at intervals.

Fig. 2.2 shows four calls recorded at 20 °C. Each vertical line represents a single pulse.

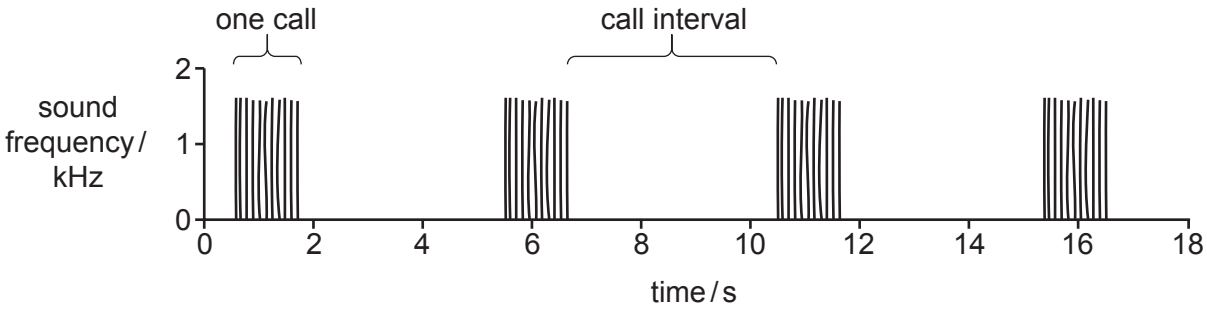

Fig. 2.2

A scientist wanted to find out if there was a relationship between body temperature and the interval between calls.

The scientist put each frog in a temperature-controlled environment. The scientist took the body temperature of each frog before recording the mating calls.

(a) State **one** variable, **other than** temperature, that should be standardised while making the recordings of the male gray tree frogs.

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(b) Recordings were made of 50 frogs with body temperatures between 9.0 °C and 33.5 °C.

The scientist measured the length of time of the intervals between the calls made by each frog. The results are shown in the scatter graph in Fig. 2.3.

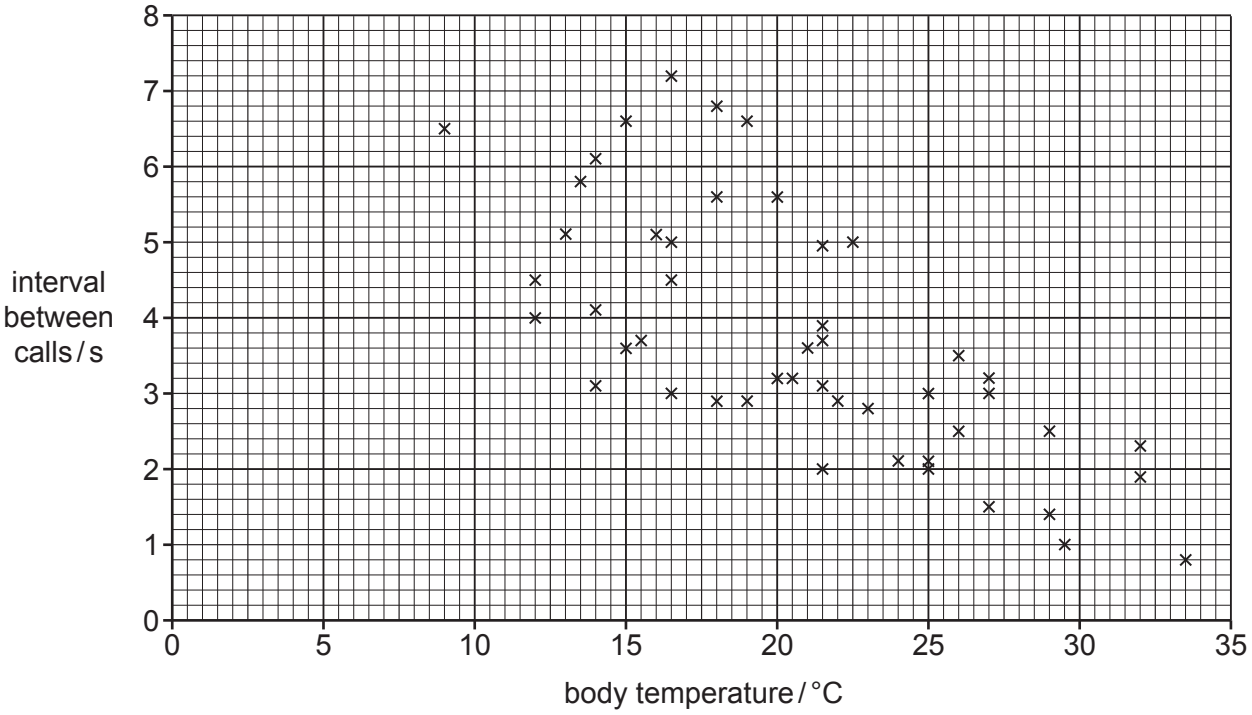

Fig. 2.3

Describe the trend shown by the scatter graph in Fig. 2.3.

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(c) The scientist analysed the data in Fig. 2.3 by using Pearson's linear correlation test.

(i) State **three** reasons why this statistical test is a suitable way to analyse the data.

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(ii) State a null hypothesis for this investigation.

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(iii) The scientist calculated the value of Pearson's correlation coefficient, ***r***, to be **–0.717**.

Table 2.1 shows the probability table for Pearson's linear correlation test.

Table 2.1

numbers of pairs of measurements	**critical values**	
	p = 0.05 (5%)	p = 0.01 (1%)
48	0.285	0.368
49	0.282	0.365
50	0.279	0.361
51	0.276	0.358
52	0.273	0.354

Use the calculated value of ***r*** and Table 2.1 to explain whether the correlation is significant.

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(d) The scientist extended the study by investigating other features of the mating calls of male gray tree frogs.

Fig. 2.4 shows recordings of the mating calls from two male gray tree frogs kept at different temperatures. Each vertical line represents a single pulse.

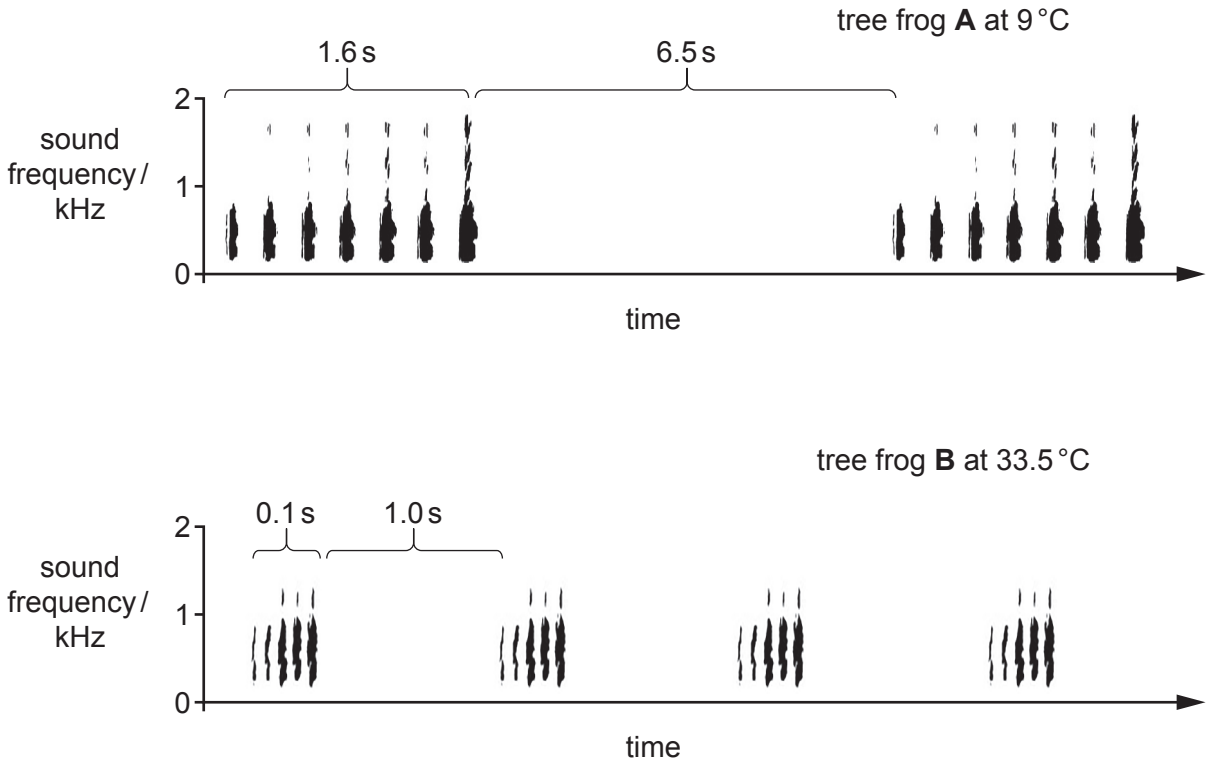

Fig. 2.4

Describe **two** features of the mating calls shown in Fig. 2.4, **other than** length of time between the calls, that could be studied.

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(e) Other scientists have studied gray tree frogs in the wild. Their first task in these studies is to gain an estimate of the population in each study area.

Describe how a population of frogs, such as *D. versicolor*, could be estimated by using the mark-release-recapture method.

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[Total: 13]