Centre Number	Candidate Number	Name

CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

BIOLOGY **0610/06**

Paper 6 Alternative to practical

May/June 2003

1 hour

Candidates answer on the Question Paper.
No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre Number, Candidate Number and Name on all the work you hand in.
Write in dark blue or black pen in the spaces provided on the Question Paper.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
The number of marks is given in brackets [ ] at the end of each question or part question.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

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1	
2	
3	
4	
TOTAL	

This document consists of **9** printed pages and **3** blank pages.

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[Turn over

1 Three different dough mixtures, samples **A**, **B** and **C** are prepared using the same quantity of flour and water. Each sample of dough is carefully mixed, kneaded, shaped and placed in separate measuring cylinders and kept in a warm place.

Sample **A** contains warm water, sugar, flour and yeast.
Sample **B** contains warm water, sugar and flour.
Sample **C** contains warm water, sugar, flour, yeast, and substance **X**.

The highest level of the dough is marked on the side of each measuring cylinder, as shown in Fig. 1.1.

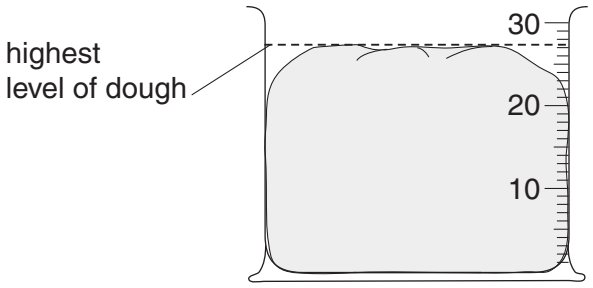


Fig. 1.1

(a) Suggest **two** other factors which should be kept constant to ensure that the results for the samples can be compared.

1. Same quantity of sugar .....

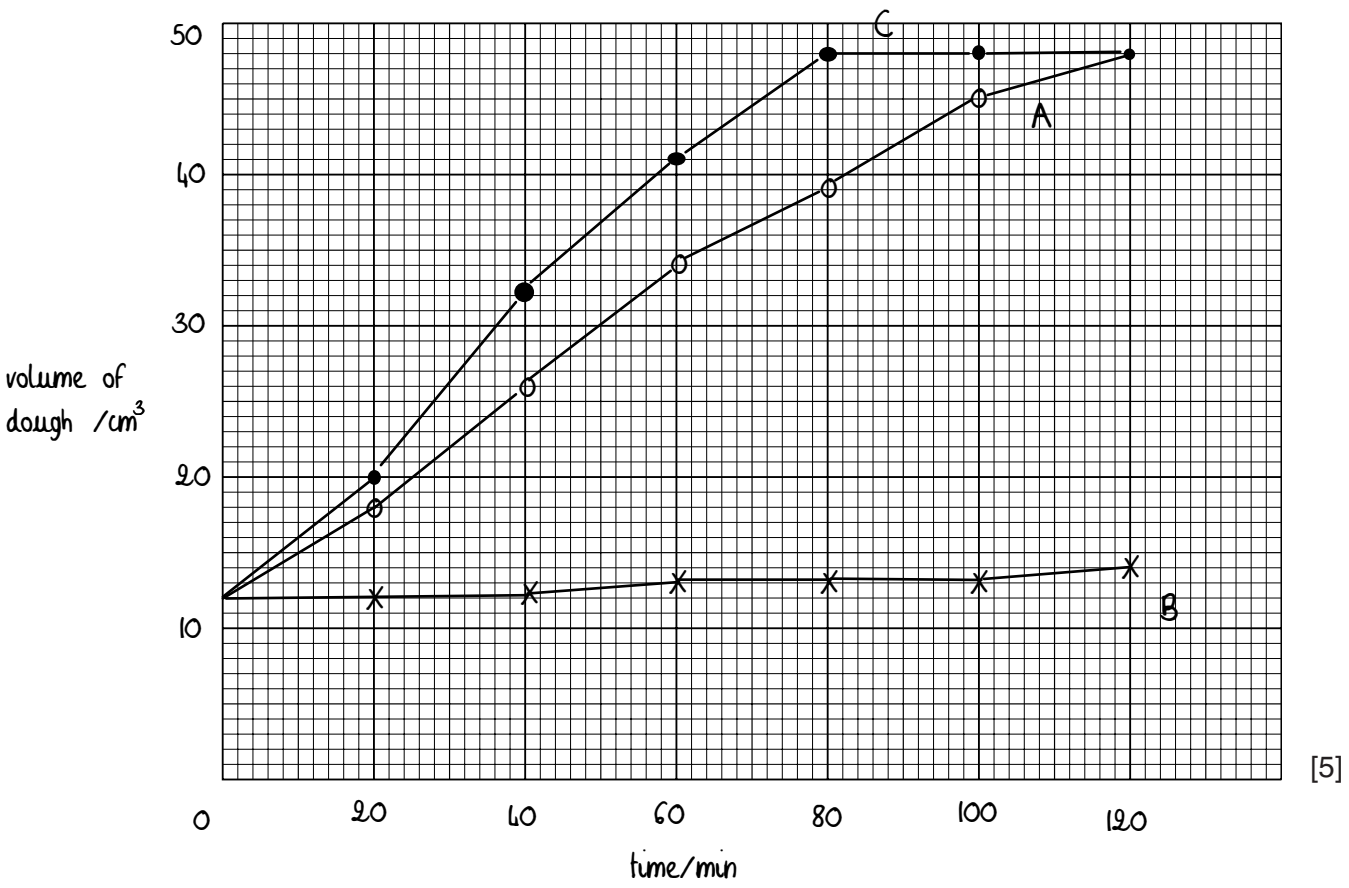
2. Same size of measuring cylinder .....[2]

(b) At 20 minute intervals, the volume of each dough sample is measured and recorded. The results are shown in Table 1.1.

Table 1.1

time / min	volume of dough / cm^3		
	sample **A**	sample **B**	sample **C**
0	12	12	12
20	18	12	20
40	26	12	32
60	34	13	41
80	39	13	48
100	45	13	48
120	48	14	48

(i) On the grid opposite, plot the data shown in Table **1.1** for samples **A**, **B** and **C** as three curves on one set of axes.



[5]

(ii) Describe the curves you have drawn for the three samples.

Line A rises steadily

Line B stays more or less at a constant level, rising only very slightly

Line C rises the most steeply and then flattens

.....

.....[3]

(iii) Use your graph to find when there is the greatest difference in volume between samples **A** and **C**.

80 min

.....[1]

(iv) The volume of sample **A** changed differently to the volume of sample **B**. Suggest an explanation for this difference.

Sample A showed a greater increase in volume since it contained yeast which gives off carbon dioxide as it respires. Sample B had no yeast.

.....

.....[2]

(v) The volume of sample **A** changed differently to the volume of sample **C**. Suggest an explanation for this difference.

Although the final volumes were the same, sample C reached that volume at a faster rate. The only difference between the two samples was the presence in Sample C of substance X which may have been an enzyme which helped to speed up the chemical reactions in the mixture. [2]

[Total : 15]

2 Fig. 2.1 shows three stages in the germination of a grain of maize.

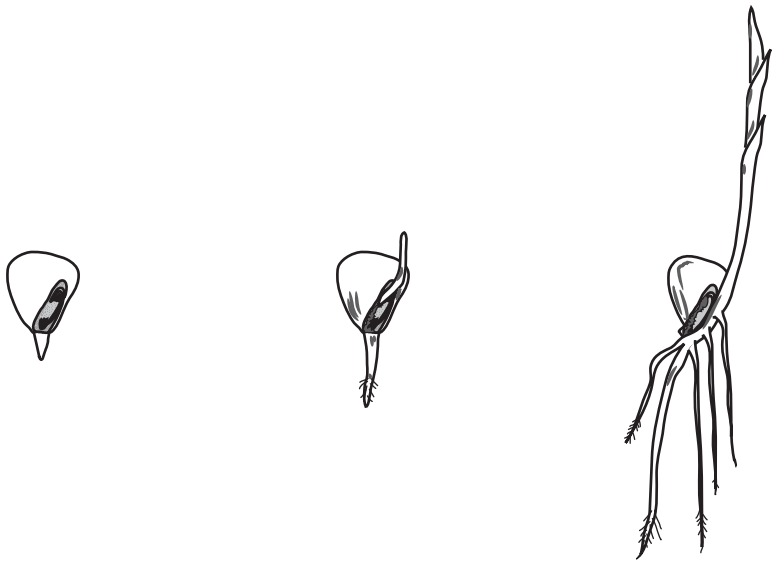


Fig. 2.1

(a) Name two conditions that are necessary for the successful germination of a seed, other than the presence of water.

1. Suitable temperature 2. Oxygen [1]

(b) Describe an investigation that you could carry out to show the need in seed germination for one of the conditions you named in **(a)**.

Taking the need for a suitable temperature as the factor to be investigated, two identical sets of apparatus are set up. Each set of apparatus should contain many seeds – all of the same species – placed on damp cotton wool in a glass jar the lid of which is open to allow entry of air. One set is placed on a bench in a warm laboratory (or, better, in a temperature-controlled propagator for growing seeds). The second set is placed in a refrigerator at 4°C. Both sets of seeds are watered daily over a period of several days. Only the seeds in the suitable temperature should germinate. [3] [Total : 4]

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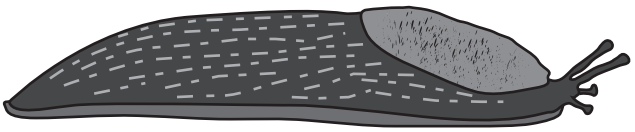
3 Fig. 3.1 shows the external appearance of animal **A**.

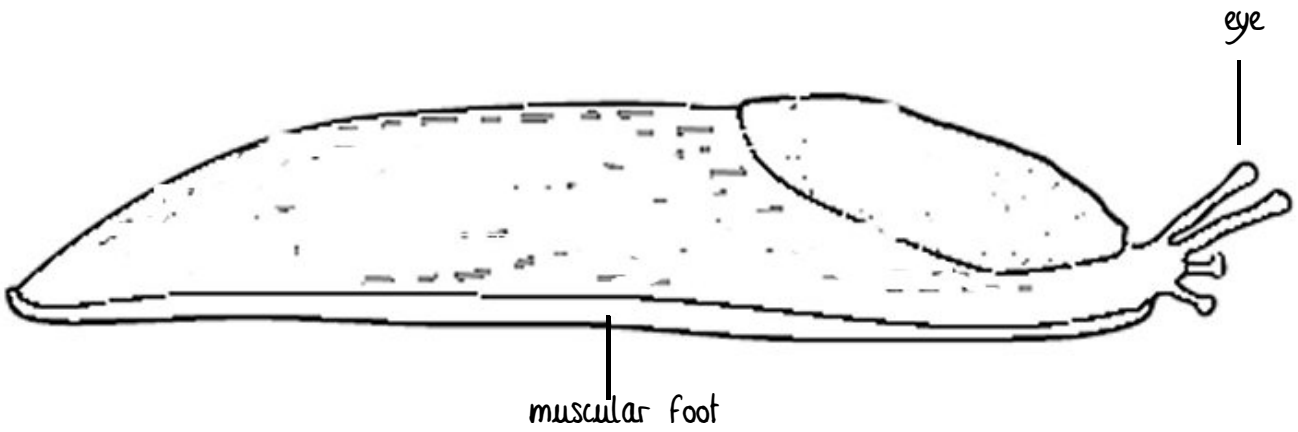


animal **A**

Fig. 3.1

(a) (i) Make a large, labelled drawing of animal **A**.

Label **two** features that are characteristic of this group of animals.



[4]

(ii) Measure the length of animal **A** in Fig. 3.1 and in your drawing. Calculate the magnification of your drawing.

*length of animal **A**: in Fig. 3.1* ..... 75 mm .....

in drawing ..... 135 mm .....

magnification ..... $\frac{135}{75} = \times 1.8$ .....[2]

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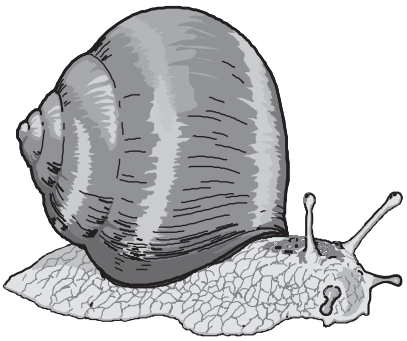
Fig. 3.2 shows the external appearance of animal **B**, which is classified in the same group as animal **A**.



animal **B**

Fig. 3.2

(iii) State one similarity which indicates that these two animals are classified in the same group and state one difference between them.

similarity They both have tentacles

difference Animal B has a large external shell (absent in animal A) [2]

(iv) Name the group to which animals **A** and **B** belong.

the molluscs [1]

[Total : 9]

[Turn over

4 The apparatus shown in Fig. 4.1 was set up under bright light for a period of five hours. At the start the apparatus was completely full of water. During this time, a gas was collected at the top of the graduated tube.

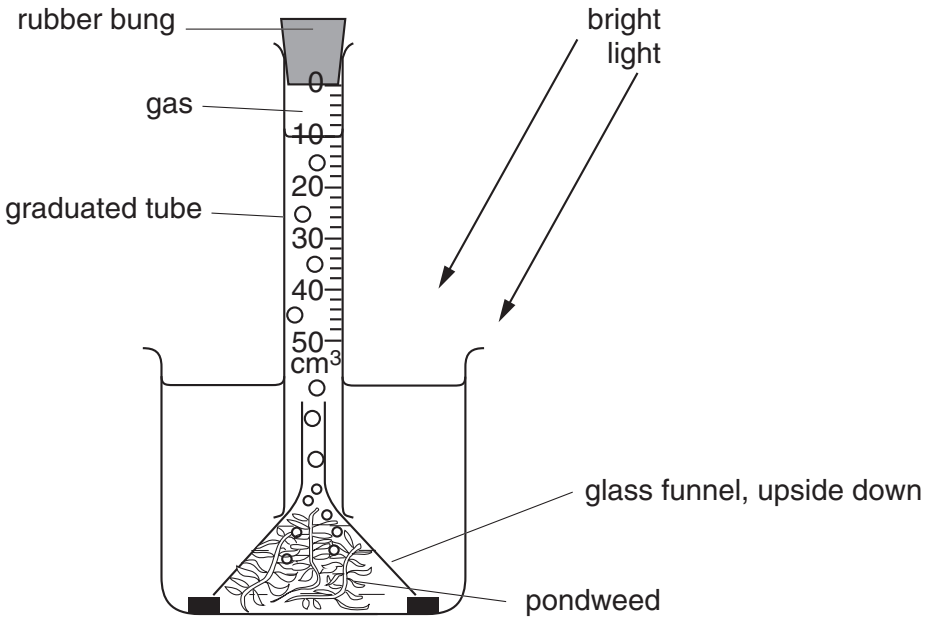


Fig. 4.1

(a) (i) How would you show this gas was oxygen?

The rubber bung is removed and a glowing splint quickly put into the top of the tube. The splint will relight. [1]

(ii) Name the process within the plant responsible for the production of oxygen.

photosynthesis [1]

(iii) Determine the volume of gas collected in five hours and the rate of gas production per hour.

volume 10 cm^3 of oxygen was collected in 5 hours

rate 10 ÷ 5 = 2 cm^3 per hour [2]

(iv) How would you use this apparatus to obtain reliable results to show the effect of differing light intensities on the production of oxygen?

The rate of oxygen production is measured first with a lamp as close to the apparatus as possible, then the experiment is repeated several times, each time with the lamp further away from the apparatus. Heat from the bulb is prevented from affecting the result by placing a clear glass sheet between the lamp and the apparatus, and the pond weed is left for several minutes in each new light intensity to allow it to adjust to the new conditions before the rate is measured. [2]

(b) The pondweed was placed in hydrogencarbonate indicator solution, which was red in colour when the tube was set up. The tube was left for five hours in bright light, as shown in Fig. 4.2.

(Hydrogencarbonate indicator is purple in alkaline conditions, red in neutral conditions and yellow in acidic conditions.)

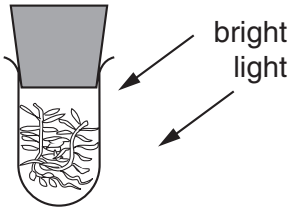


Fig. 4.2

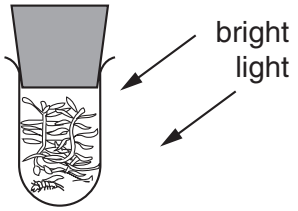


Fig. 4.3

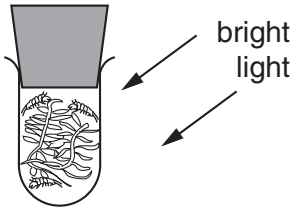


Fig. 4.4

(i) Suggest what colour you might observe in the tube in **Fig. 4.2** after five hours in bright light and give an explanation for this.

colour The liquid in the tube in Fig 4.2 would turn purple.

explanation carbon dioxide is used up during photosynthesis

.....[2]

(ii) One water shrimp was introduced into a similar tube with pondweed, **Fig. 4.3**, and, again, the tube was placed in bright light for five hours.

Suggest what colour you might observe and give an explanation for this.

colour The liquid in the tube in Fig. 4.3 would probably stay red.

explanation There would be a balance between photosynthesis and respiration in the tube.

.....[2]

(iii) Three water shrimps were introduced into a similar tube with pondweed, **Fig. 4.4**, and, again, the tube was placed in bright light for five hours.

Suggest what colour you might observe and give an explanation for this.

colour The liquid in the tube in Fig. 4.4 would turn yellow.

explanation Three respiring water shrimps would produce more carbon dioxide than the pondweed would use up in Photosynthesis.....[2]

[Total : 12]

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Summary of Examiner's Notes on IGCSE Biology Paper 6 June 2003

Page: 2

Q1 (a) There are other equally valid factors including the same type of yeast or flour, or the same mass of each dough mixture. The 'warm place' should provide all sets of apparatus with the same temperature. Be realistic; light and carbon dioxide would be unlikely to have any effect on the process, pH would be difficult to control but would be unlikely to be different in each cylinder anyway, and time is one of the variables used in the experiment.

Q1 (b) i Use a sharp pencil and label both axes including the units. Choose an even scale for each axis that uses up as much of the grid as possible. The controlled variable (time) is plotted on the x (horizontal) axis and the dependant variable (i.e. the one that changes as a result in a change of the other) is plotted on the y (vertical) axis. Clearly distinguish between the three sets of data. Join your plotted points with ruled lines or lines of best fit.

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Q1 (b) iii Make sure you have looked for the difference between the correct two samples!

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Q1 (b) v Since the respiration of yeast is the chemical reaction responsible for producing the carbon dioxide, then an enzyme (or catalyst) would be the likely identity of substance X.

Page: 5

Q2 (a) If you state a temperature, then make sure that it is realistic (10 to 30° C). Remember that the presence of light is rarely necessary for a seed to germinate.

Q2 (b) If you choose to investigate the need for oxygen, exactly the same procedure is followed, except both sets of seeds are left in a suitable temperature, but one jar has a smaller container in it with a chemical (alkaline pyrogallol) for absorbing oxygen. This jar is then firmly corked to prevent the entry of air. Remember that to use only one seed would not give a conclusive result and you should always describe two sets of apparatus – one is the experiment, the other is the control.

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Q3 (a) i Make sure you use a sharp pencil and that your outline is clear. The proportions of your drawing should be as accurate as you can make them and the drawing should be as large as you can fit into the space provided. Two features only should be labelled. Other acceptable ones are tentacles, dorsal hump and unsegmented body.

Q3 (a) ii The measurements taken here are to the front of the head at the base of the tentacles. It would be equally valid to take your measurements to the end of the tentacles, but that is not so easy to measure. Units used should be mm and the magnification given as ‘ x…followed by a figure’ correct at least to one decimal place and to not more than two.

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Q3 (a) iii References to similar heads and eyes would be acceptable.

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Q4 (a) i A burning splint is NOT used as a test for oxygen. The glowing splint is the standard test though more ingenious ones using pyrogallol to absorb the oxygen may be possible.

Q4 (a) iii The mathematics is simple, but note that the experiment ran for 5 hours and you are asked for a rate per hour.

Q4 (a) iv Bulbs of different brightness could be used, and, as alternatives to mentioning the heat precaution, references to ensuring that the pond weed always had sufficient carbon dioxide (by adding hydrogencarbonate) would be valid, as would reference to the value of repeating experiments or ensuring that the same piece of pondweed was used each time.

Q4 (b) i Since CO_2 in solution is acidic and the solution in Fig. 4.2 was neutral at the start of the experiment, the pH will become alkaline as CO_2 is used up.

Q4 (b) ii If the pondweed uses up <u>exactly</u> the amount of CO_2 released by the shrimp during respiration, the solution will remain red. If the shrimp is active, then there may be a slight surplus of CO_2 dissolved in the water, nudging the pH towards acidic and making the colour nearer to orange.