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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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1531139600 2

BIOLOGY **9700/53**

Paper 5 Planning, Analysis and Evaluation **October/November 2013**

1 hour 15 minutes

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 ink.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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

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1 **(a)** Fig. 1.1 shows a simple respirometer that can be used to measure the rate of respiration by measuring oxygen uptake.

For Examiner's Use

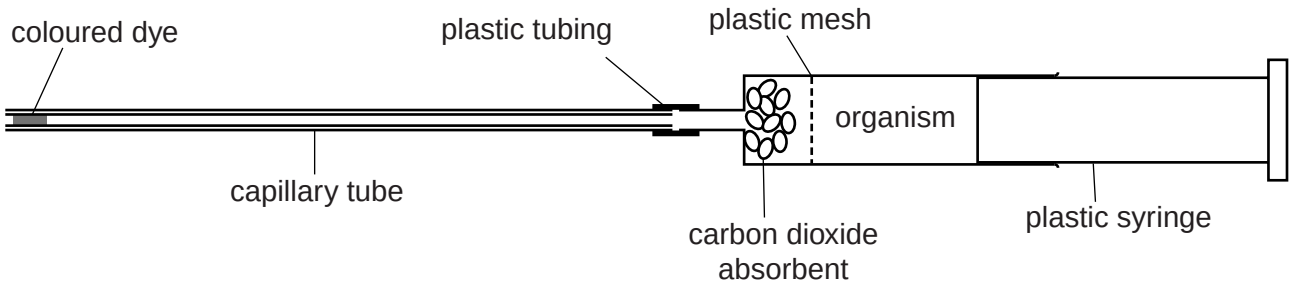

Fig. 1.1

A student used this apparatus to test the hypothesis:

The rate of respiration will double for every 10°C rise in temperature.

(i) Identify the independent and dependent variables in this investigation.

independent variable .....

.....

dependent variable .....

..... [2]

(ii) Sketch a graph to show the expected results **if the student's hypothesis is correct**.

[2]

(iii) Describe how the student could use the apparatus in Fig. 1.1 to test this hypothesis using germinating seeds.

For Examiner's Use

Your method should be detailed enough for another person to use.

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..... [8]

For Examiner's Use

(b) The student calculated the rate of respiration as volume of oxygen taken up per unit mass of the germinating seeds.

Explain how this rate of respiration was calculated.

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.....[3]

(c) Outline how the student could use the apparatus in Fig. 1.1 to find the optimum temperature for respiration in the germinating seeds.

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.....[2]

(d) In a different investigation the student measured the effect of external temperature on the oxygen uptake of a small mammal.

Careful attention was paid to the welfare of the mammal during the investigation.

Table 1.1 shows the results of this investigation.

Table 1.1

environmental temperature / °C	oxygen uptake / arbitrary units				
	trial 1	trial 2	trial 3	trial 4	mean
5	52	36	48	45	45.3
10	42	32	35	36	36.3
15	35	25	29	24	28.3
20	28	15	17	22	20.5
25	17	10	11	9	11.8
30	14	11	13	10	12.0
35	12	10	11	11	11.0

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(i) State why the student decided that the results from trial 1 were anomalous.

For Examiner's Use

.....

.....[1]

(ii) Suggest a reason for the cause of these anomalous results in trial 1.

.....

.....[1]

(iii) Suggest an explanation for the higher rates of oxygen uptake of the small mammal at the low temperatures.

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.....[2]

[Total: 21]

For Examiner's Use

2 **(a)** In plants the growth regulator, auxin, is synthesised in the stem tip and moves away from the tip. The movement of auxin through plant tissues was investigated using bean seedlings as shown in Fig. 2.1.

The following procedure was used.

- Stems were cut into 60 mm lengths.
- Agar blocks containing radioactive auxin were placed on the apical surfaces of two groups of stem lengths.
- The basal ends of the stem lengths were placed on agar blocks without any auxin to provide support.

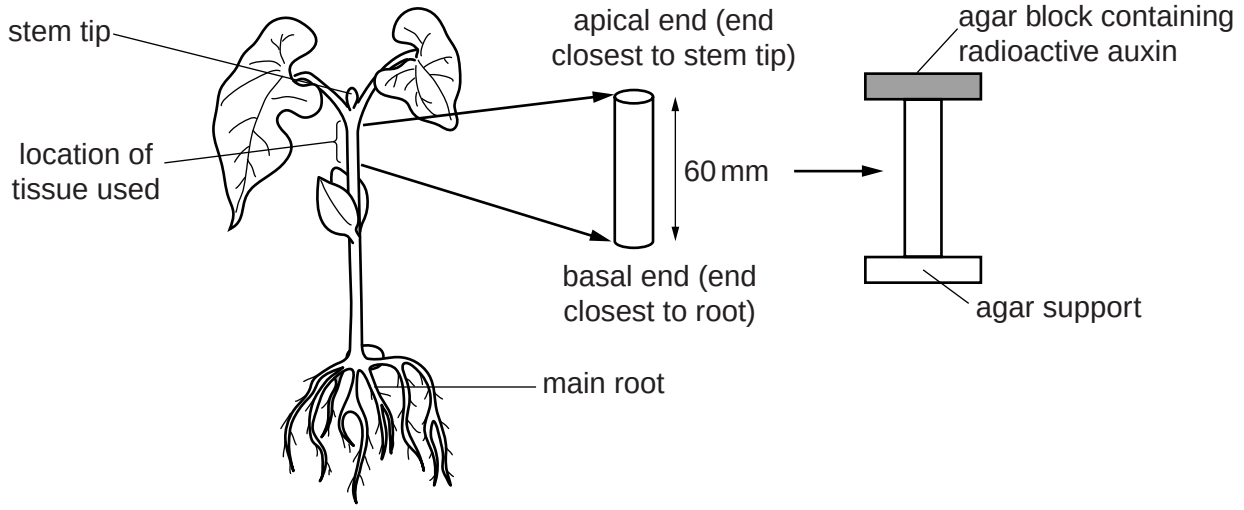

Fig. 2.1

- After 10 minutes the agar blocks at the apical ends were removed.
- One group of stem lengths was placed in air and the other group in an atmosphere of nitrogen.
- Both groups were left in light for 30 minutes after removing the agar blocks.
- The position of the radioactivity was located.

Fig. 2.2 shows the results of the investigation.

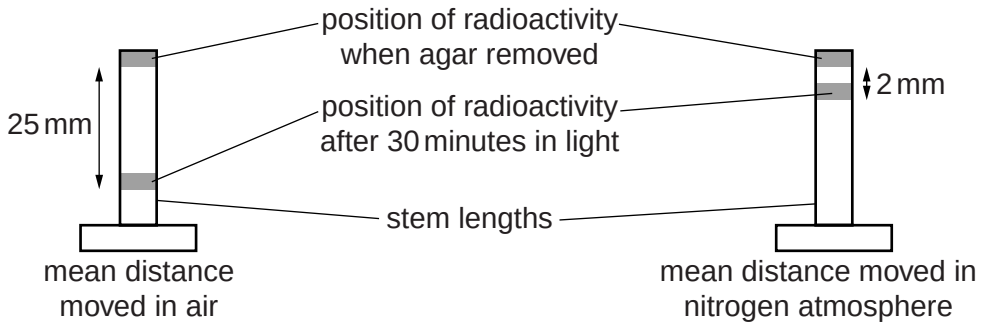

Fig. 2.2

(i) Identify one variable that should be standardised during this investigation.

.....[1]

(ii) Suggest **one** conclusion that can be made from these results.

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.....[1]

(iii) Calculate the rate in mm h^{-1} of movement of auxin in air.

For Examiner's Use

.....

.....[1]

(b) A similar investigation was carried out to test the hypothesis:

The rate of movement of auxin will be faster in plants grown in the light than plants grown in the dark.

Table 2.1 shows the results of this investigation.

Table 2.1

plants grown in light										**plants grown in the dark**									
sample number										sample number									
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
rate of movement mm h^{-1}																			
56	61	66	52	50	68	76	51	55	64	45	52	42	35	55	38	32	37	45	51
mean ± standard deviation *(s)* = 59.9 ± 8.5										mean ± standard deviation *(s)* = 43.2 ± 7.7									

(i) State **two** pieces of evidence from Table 2.1 that support the hypothesis.

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.....[2]

(ii) A *t*-test was carried out to see if the difference in the rates of movement of auxin in plants grown in the light and plants grown in the dark was significant.

Suggest a null hypothesis for this statistical test.

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.....[1]

(iii) Explain how the student should use the value for *t* to find out if the difference in the rates of movement of auxin is significant.

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.....[3]

[Total: 9]

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