

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Teacher's Use Total ISA mark

General Certificate of Education
June 2009
Advanced Subsidiary Examination



BIOLOGY
Investigative Skills Assignment (ISA)
Written test

BIO3T/Q09/test

For submission by 15 May 2009

<p>For this paper you must have</p> <ul style="list-style-type: none"> the task sheet, your results and your graph a ruler with millimetre measurements. <p>You may use a calculator.</p>
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For Teacher's Use	
	Mark
Stage 1 skills	
Stage 2 skills	
Section A	
Section B	
TOTAL ISA MARK	

Time allowed: 1 hour 15 minutes

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The maximum mark for this test is 34.
- The marks for questions are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.
- Use accurate scientific terminology in all answers.

Signature of Teacher marking this ISA..... Date.....

SECTION A

These questions relate to your investigation on water potential in potato tissue
Use the task sheet, your results and your graph to answer them.

Answer **all** questions in the spaces provided.

- 1** Each potato core should have been put in a sucrose solution for approximately 24 hours.
Explain why they should all have been left this long.

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(2 marks)

- 2** You covered the potato cores with a moist paper towel until they were needed.
Explain why this is important.

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(2 marks)

- 3** How many readings did you take for each of the sucrose solutions? Use your data to explain why you took this number of readings.

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(1 mark)

- 4 Calculate the mean rate of movement for each sucrose solution, if you have not already done so. For which sucrose concentration is your mean rate of movement **least** reliable?

Tick the appropriate box.

0.1

0.2

0.3

0.4

0.5 mol dm⁻³

Use your data to explain why this mean rate of movement was the least reliable.

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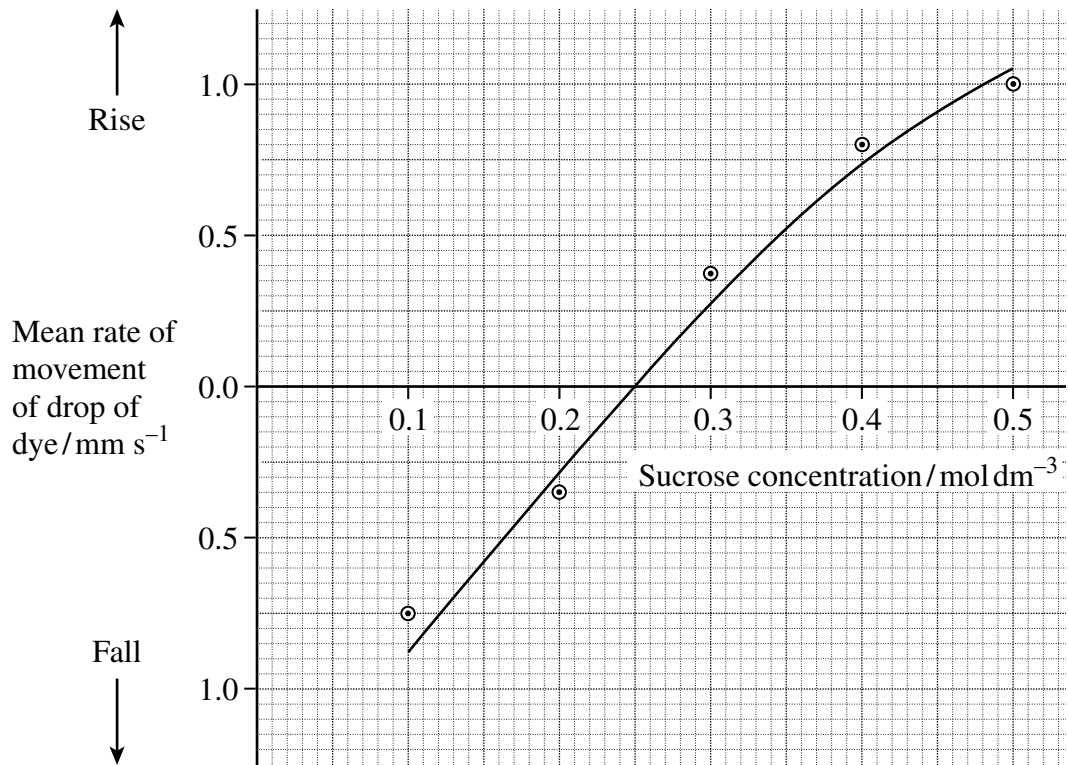
(1 mark)

Turn over for the next question

Turn over ►

5 **Figure 1** is a graph drawn by a student who carried out the same investigation.

Figure 1



5 (a) Use **Figure 1** to describe how sucrose concentration affects the mean rate of movement of the dyed drop.

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(2 marks)

5 (b) Between which sucrose concentrations was there an increase in the density of the sucrose solution surrounding the potato core?
Explain why this increase in density occurred.

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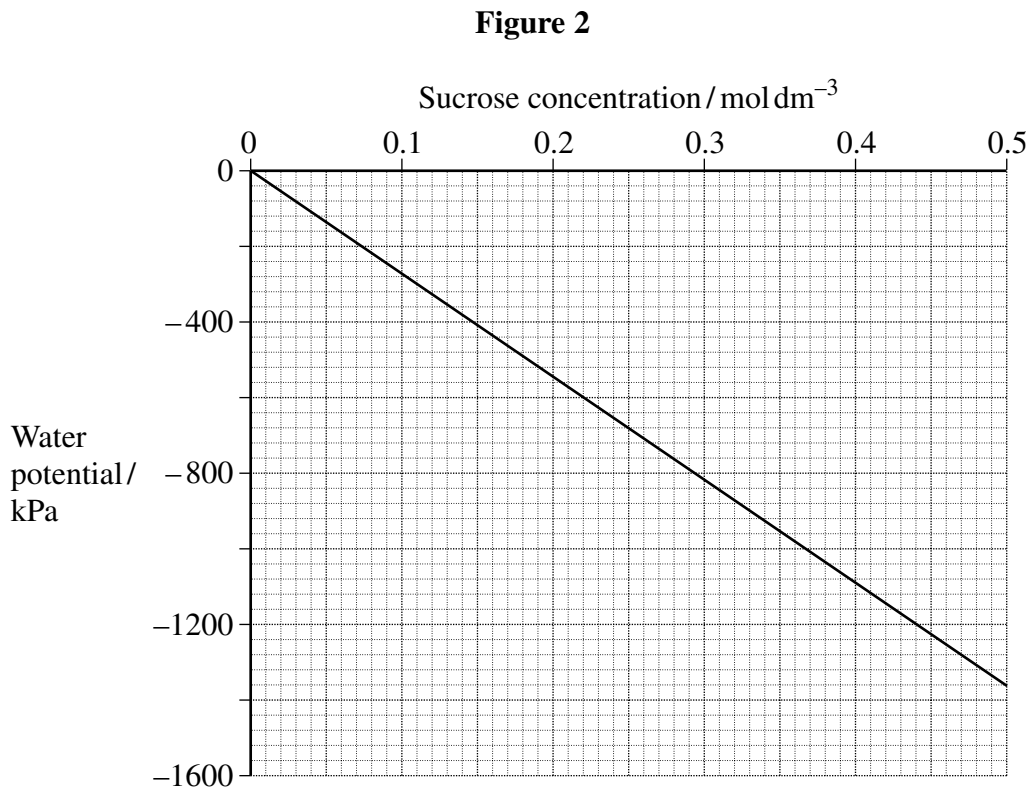
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(3 marks)

6 **Figure 2** shows the relationship between sucrose concentration and water potential.



Use **Figure 1** and **Figure 2** to work out the water potential of the potato tissue. Explain how you arrived at your answer.

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(2 marks)

7 You used changes in density to find the water potential of the potato tissue. Give **two** limitations of this method that could make your results or conclusions unreliable.

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(2 marks)

RESOURCE SHEET

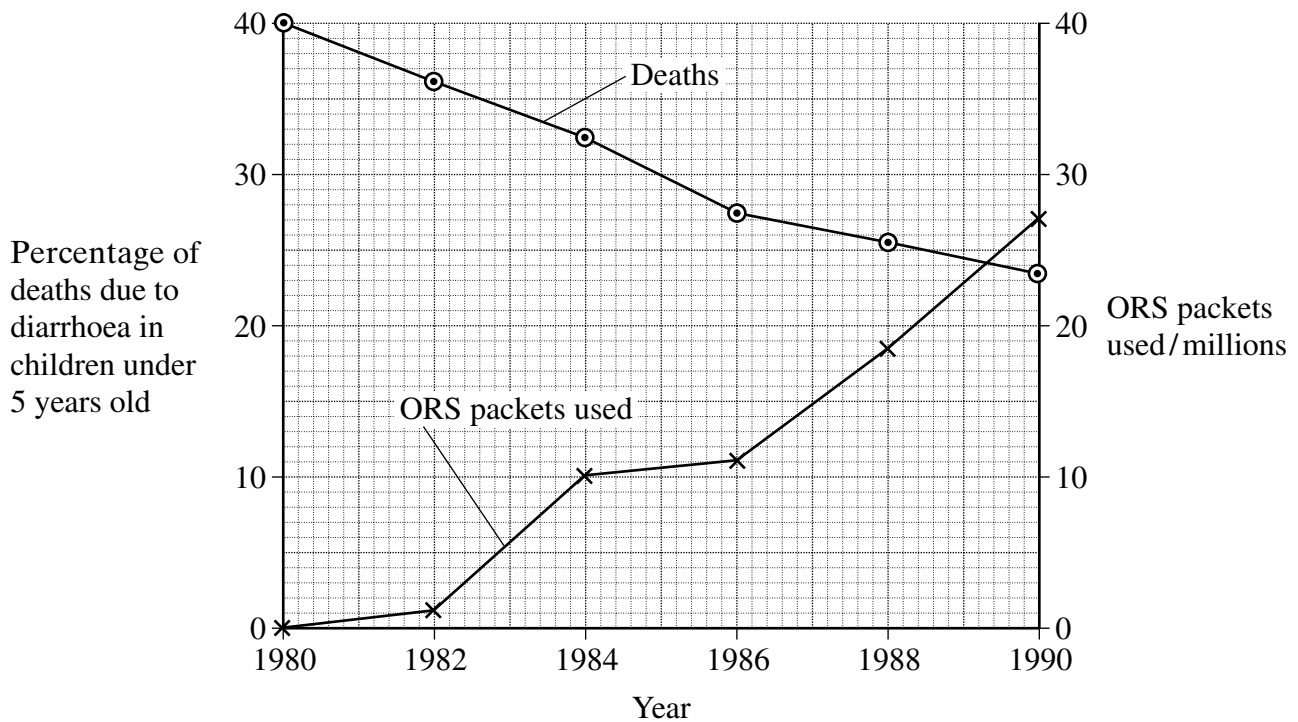
Background Information

- In 1980 it was estimated that 4.4 million children under 5 years of age died because of diarrhoea.
- In 1999 it was estimated that 1.5 million children under 5 years of age died because of diarrhoea.
- Oral rehydration solution (ORS) was first used to treat diarrhoea in 1979.
- By 1999 it was estimated that 50% of all cases of diarrhoea were treated with ORS.

Resource A

Figure 3 shows the percentage of deaths due to diarrhoea in children under 5 years old and the number of ORS packets used from 1980 to 1990. The data all relate to children under 5 in Brazil.

Figure 3



Resource B

In Central America, many people use a porridge made from rice to treat children who have diarrhoea. Doctors investigated the effect of this porridge in the treatment of diarrhoea. They compared the porridge with the World Health Organisation standard ORS.

The doctors divided a group of 70 children with diarrhoea into two groups. They gave the porridge to the experimental group and the standard ORS to the control group.

Table 1 shows the mean gain in body mass during the hospital stay.

Table 1

	Mean gain in body mass during hospital stay / kg (\pm standard deviation)	Minimum change in body mass during hospital stay / kg	Maximum change in body mass during hospital stay / kg
Experimental group (rice-based porridge)	0.233 (\pm 0.202)	0.00	+ 0.82
Control group (standard ORS)	0.217 (\pm 0.180)	- 0.15	+ 0.80

Figure 4 shows the mean faecal output during the study period.

Figure 4

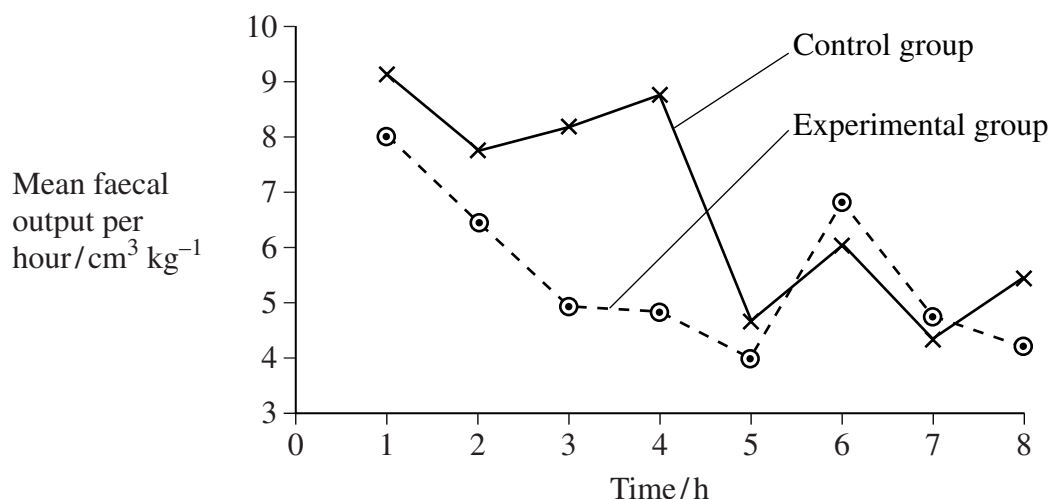


Table 2 shows the water potentials of the rice based porridge, of the standard ORS and of blood.

Table 2

Solution	Water potential / kPa
Rice-based porridge	-550
Standard ORS	-770
Blood	-700

Turn over ►

SECTION B

Use the information in the **Resource Sheet** to answer the questions.

Answer **all** questions in the spaces provided.

Use **Resource A** to answer **Question 8**.

- 8 (a) Describe the relationship between the percentage of deaths due to diarrhoea in children under 5 years old and the use of ORS.

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(1 mark)

- 8 (b) It is **not** possible to conclude from **Figure 3** that the use of ORS caused the reduction in deaths from diarrhoea in children under 5 years old. Explain why.

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(2 marks)

Use **Resource B** to answer the **Questions 9 to 16**.

- 9 The doctors treated the control group with standard ORS. Explain why a control consisting of no treatment was **not** used.

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(1 mark)

- 10** Children with hourly faecal outputs greater than $10 \text{ cm}^3 \text{ kg}^{-1}$ were classed as having severe diarrhoea. These children were excluded from the investigation.

Suggest why they were excluded.

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(2 marks)

- 11** The doctors divided the children randomly into two groups. Explain why they were divided randomly.

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(1 mark)

- 12** The doctors found out whether the treatment was successful by recording changes in body mass. This told them whether or not the children were hydrated. Suggest how changes in body mass can show whether the children were rehydrated.

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(2 marks)

Turn over ►

13 (a) In **Table 1**, what do the values for standard deviation tell you about the mean gain in body mass during the children’s stay in hospital?

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(1 mark)

13 (b) What can you conclude from the data about minimum changes in body mass during the hospital stay?

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(1 mark)

14 (a) Using **Figure 4**, describe how the mean faecal output for the experimental group was different from that in the control group, during the first 4 hours of treatment.

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(2 marks)

14 (b) The doctors suggested that this difference in faecal output was due to the amount of water reabsorbed into the body from the intestines.

Use **Table 2** and your knowledge of osmosis to explain the difference in faecal output.

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(2 marks)

15 What conclusions can you draw about the use of rice-based porridge as an alternative to the standard ORS? Use the data to support your answer.

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(2 marks)

16 ORS is used to prevent dehydration due to cholera. Explain why a person with cholera suffers from dehydration unless treated with ORS.

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(2 marks)

END OF QUESTIONS