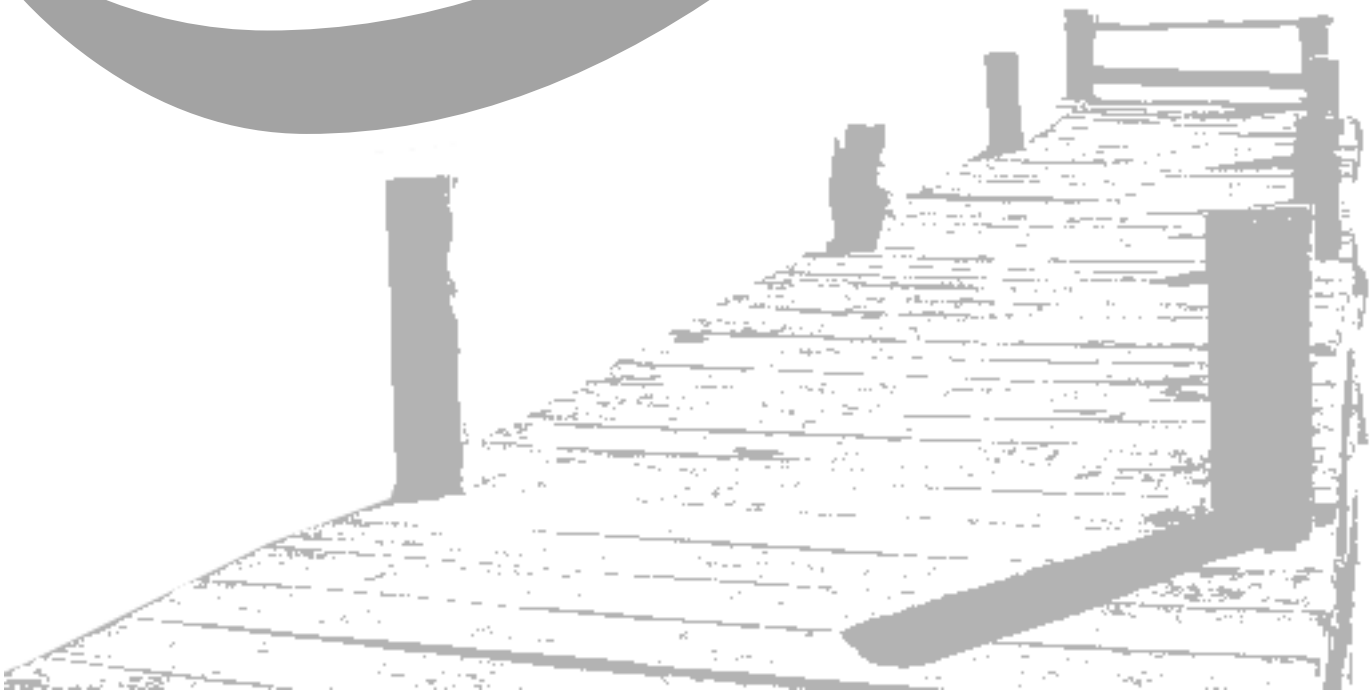
GCE
AS and A Level

Human Biology

AS exams 2009 onwards
A2 exams 2010 onwards

Unit 3T:
Specimen question paper

Version 1.1



Version 1.1

Surname		Other Names	
Centre Number						Candidate Number				
Candidate Signature										

General Certificate of Education
Advanced Subsidiary Examination

HUMAN BIOLOGY **HBI3T**
INVESTIGATIVE SKILLS ASSIGNMENT (ISA)
AS Centre Assessed Unit

Draft Specimen Paper

In addition to this paper you will require
- results, table and charts or graphs from your own investigation
- a ruler with millimetre measurements
- you may use a calculator

Time allowed: 1 hour 15 minutes

For Teacher's Use	
	Mark
Section 1 and 2 Skills	
Section A	
Section B	
TOTAL	

Instructions
- Use black ink or 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 marked

Information
- The maximum mark for the ISA is 44.
- 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

The questions in this section of the paper are about the investigation you carried out.

That includes the data you obtained and processed and the graph you plotted.

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

1 What was the independent variable in your investigation? Explain your answer.

Independent variable.....

Explanation.....

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(1 mark)

2 (a) Describe how you kept **one** other **named** variable constant in your investigation.

Name of variable.....

How the variable was kept constant.

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(1 mark)

(b) Use information from your investigation to explain what is meant by

(i) controlling a variable

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(ii) monitoring a variable.

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(2 marks)

3 P*ercentage change* in diameter of the onion rings is better to use than change in diameter. Explain why.

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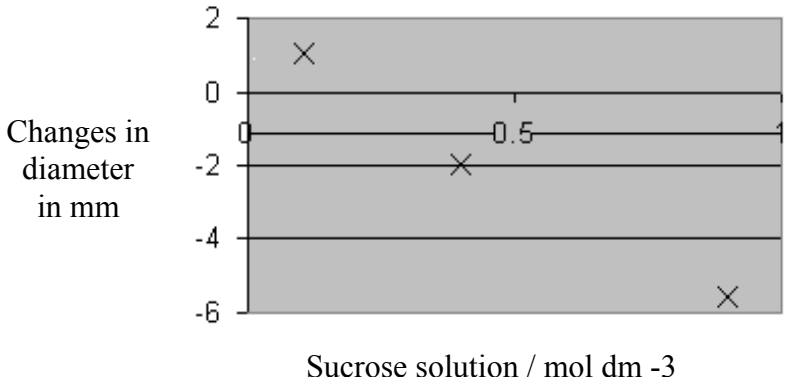
(2 marks)

4 A student carried out a very similar investigation to yours. The graph shows how he plotted his results.



(a) Use the graph to find the concentration of the external solution that produces no net change in diameter.

Concentration of external solution.....

(1 mark)

(b) What does the answer to part (a) tell you about the plant cells.

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(1 mark)

(c) Explain what is meant by *no net change* in the plant tissue.

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(2 marks)

(d) What conclusions are you able to draw from the graph? Use your biological knowledge to support your conclusions.

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(5 marks)

(e) The conclusions you came to using your graph may be more reliable that those from the graph of this student. Suggest why.

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(2 marks)

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SECTION B

This section of the paper is about fluid loss during exercise and how different sports drinks affect the movement of water in and out of cells. You should use the information given together with your own knowledge to answer the questions.

Sweat is a dilute salt solution that evaporates from the skin surface to help cool the body. During exercise, up to 2 litres of sweat per hour is secreted. Sweat is formed from tissue fluid which occupies spaces between cells. Tissue fluid is normally formed from the blood but fluid can also move out of cells which surround the tissue spaces. Loss of fluid from cells can result in dehydration. Loss of salts in sweat - in the form of electrolytes - can result in more water moving into surrounding cells further reducing the water content of blood.

Research conducted with an American football team showed that rehydration after exercise was more effective if, rather than water, an isotonic solution - such as those now available as sports drinks - was consumed. Furthermore, it was shown that drinking isotonic solutions during a game helped the footballers to maintain activity for longer periods of time.

Resource A

The loss of water from the body as sweat can affect the physiology of the body.
The table shows the effect of losing different percentages of body weight.

Percentage of body weight lost as sweat	Physiological effect
2	Reduced performance
4	Decline in capacity for muscular work
5	Heat exhaustion
7	Hallucinations
10	Collapse of blood circulatory system

Resource B

Sports coaches define sports drinks as isotonic, hypotonic or hypertonic. The table shows the contents of the three types.

Type	Content
Isotonic	Fluid, electrolytes, carbohydrate (6-8%)
Hypotonic	Fluid, electrolytes, low carbohydrate concentration
Hypertonic	Fluid, electrolytes, high carbohydrate concentration

Resource C – Muscles store a carbohydrate called glycogen. Scientists studied effects of carbohydrate intake by athletes on use of glycogen by their muscles. They studied 7 recreational runners who completed a 60 minute treadmill run. The table shows the results of the study.

	First trial	**Second trial**
Type of fluid consumed	Isotonic sports drink (5.5% carbohydrate)	Water
Fluid intake before run / $cm^3\ kg^{-1}$ body weight	8	8
Fluid intake 20 minutes into run / $cm^3\ kg^{-1}$ body weight	2	2
Fluid intake 40 minutes into run / $cm^3\ kg^{-1}$ body weight	2	2
Glycogen utilisation / mmol kg^{-1} dry matter	125.0	170.8

Resource D – Survey of one football team for sports drink preference

- Isotonic sports drinks were the most popular choice.

Use the information provided and your own knowledge to answer the following questions.

5 Do you consider the scientists' research (line 9) and **Resource D** to be sufficient to justify the investment by manufacturers in the development of sports drinks? Explain your answer.

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(3 marks)

6 (a) What mass of sweat will a 75kg male have lost if he begins to suffer from heat exhaustion?

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(1 mark)

(b) Suggest how the amount of sweat lost by an athlete during a five kilometre run could be determined.

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(2 marks)

7 (a) When 4% of body weight is lost as sweat, the physiological effect is described as a decline in capacity for muscular work. (**Resource A**) How useful is this description?

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(3 marks)

(b) Loss of water and loss of electrolytes in sweat have different effects on the water potential of blood. Explain how.

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(2 marks)

8 Use the information provided in **Resource B** and **Resource C** to answer the following questions.

(a) How does information provided in these resources appear to be contradictory?

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(1 mark)

(b) Why is fluid intake expressed as cm^3 kg^{-1} body weight?

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(2 marks)

(c) The study with the recreational runners concluded that drinking sports drinks during exercise reduces glycogen utilization.

(i) Calculate the percentage reduction in use of glycogen in the sports drink trial compared with water.

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(1 mark)

(ii) Is the conclusion of the study valid? Explain your answer.

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(2 marks)

END OF QUESTIONS

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GENERAL CERTIFICATE OF EDUCATION
JUNE 200X / JUNE 200X

DRAFT AS BIOLOGY ISA: HBI3T TASK SHEET

ASSESSMENT and QUALIFICATIONS ALLIANCE

ISA Specimen Material - The movement of water in and out of cells.

Introduction

The movement of water in and out of cells can be shown using plant tissues. For example, the diameter of an onion ring will change depending on the amount of water in the onion tissue. In this investigation, you will investigate changes in the diameter of onion rings when they are placed in sucrose solutions with different concentrations.

Outline method

A Obtaining onion rings and measuring the mean diameter. (You may ask for help from your teacher for this part.)

B Carrying out the investigation. (Your teacher is not allowed to give you help with this part.)

You are provided with 5 sucrose solutions each with a different molarity.

For each molarity:

1 Cut through an onion and remove a complete onion ring.
2 Measure the diameter of the onion ring.
3 Immerse the onion ring in one of the solutions and leave for a suitable time period.
4 Remove the onion ring from the solution and dry to remove excess solution.
5 Measure the diameter of the onion ring for a second time.

You must decide:

- how many repeats to use with each concentration,
- how to control variables that might influence the data to be collected,
- what data to collect to determine the effect of the concentration of sucrose solution on the mean diameter of onion rings.