

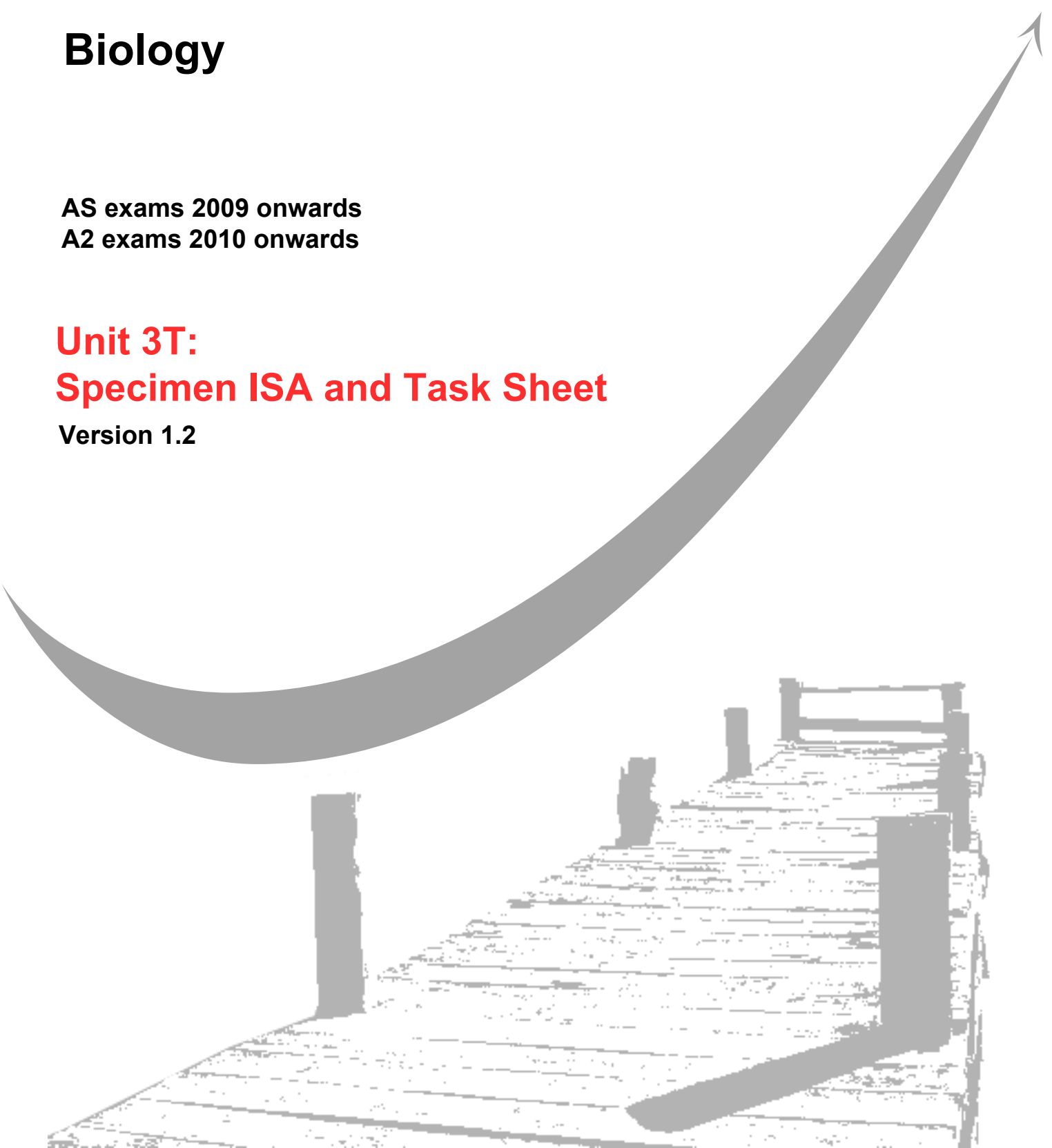
**GCE**  
**AS and A Level**

# **Biology**

**AS exams 2009 onwards**  
**A2 exams 2010 onwards**

## **Unit 3T:** **Specimen ISA and Task Sheet**

**Version 1.2**



Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

General Certificate of Education  
Advanced Subsidiary Examination



**BIOLOGY**  
**Investigative Skills Assignment (ISA)**  
**AS Centre Assessed Unit**

**BIO3T**

Draft Specimen Paper

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

Time allowed: 1 hour 15 minutes

**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 this paper 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**

These questions are about your investigation on the effect of pH on the rate of browning of apples. You should use the task sheet, your results and your graph to answer them.

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

- 1** Temperature is a variable that affects the rate of browning. Describe what you did during your investigation to take into account the effect of temperature.

.....  
.....  
*(1 mark)*

- 2** How many repeats of each pH value did you take? Use your data to support the decision you made about how many repeats to take.

.....  
.....  
*(1 mark)*

- 3** The pieces of apple you cut varied slightly in surface area. Would you expect this variation in surface area to affect the reliability of your data? Explain your answer.

.....  
.....  
.....  
.....  
*(2 marks)*

- 4** Other than temperature and the size of the pieces of apple, give **one** other variable that you tried to keep constant.

.....  
.....  
*(1 mark)*

- 5 (a) Do you think that the data in your table are reliable or unreliable?  
Tick the appropriate box.

Reliable

Unreliable

If you think any of the data are unreliable draw a circle or circles round these values in your table.

- (b) Explain the evidence from your table for your answer to part (a).

.....  
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.....  
.....

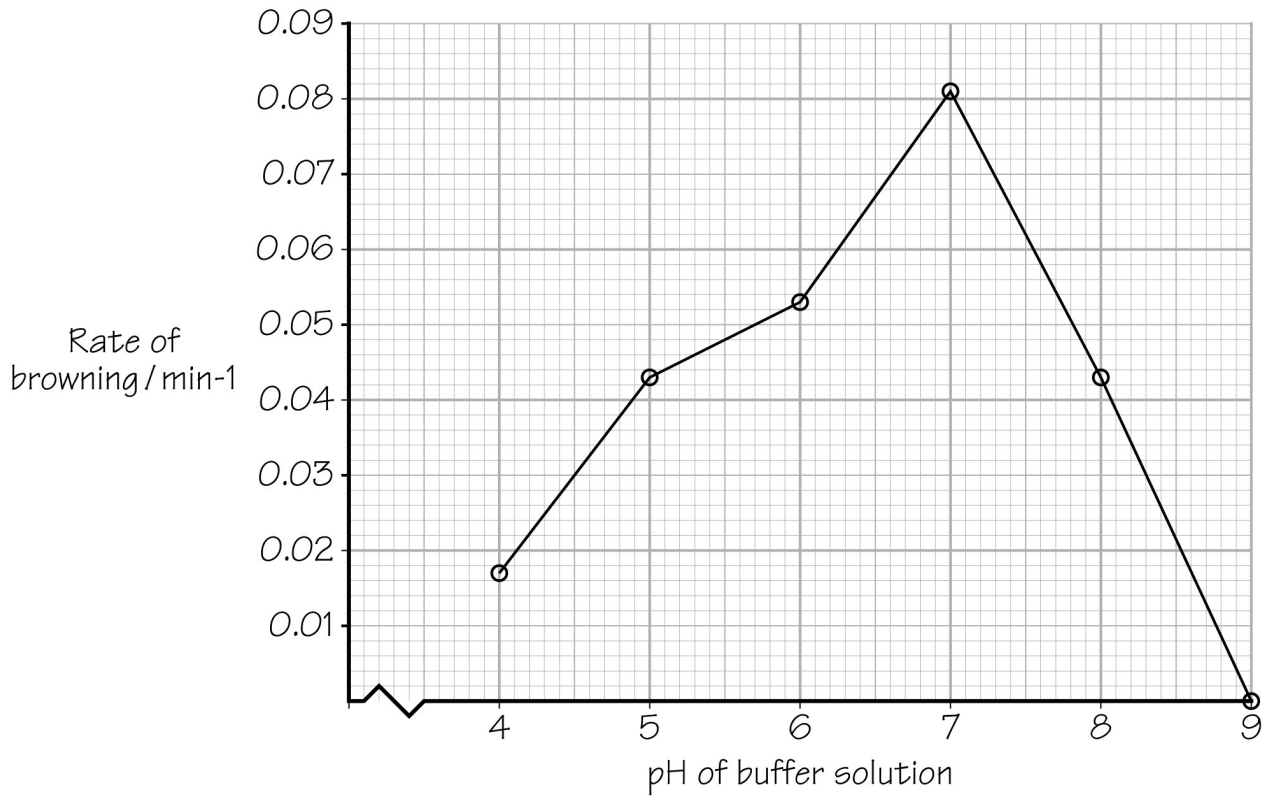
*(2 marks)*

- 6 The measurement of the rate of browning may have lead to the data being unreliable.  
Explain how.

.....  
.....

*(1 mark)*

7 Here is a graph that one student drew.



(a) Use the graph to describe how pH affects the rate of browning.

.....

.....

.....

.....

(2 marks)

(b) Use your biological knowledge to explain the results on the graph.

.....

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(3 marks)

- (c) The student had time to take readings at two more pH values. At what pH values should she have taken these extra readings? Explain your answer.

pH values .....

.....

.....

.....

.....

*(2 marks)*

**Total 15 marks**

**Turn over for SECTION B**

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**BIO3T ISA**  
**SECTION B RESOURCE SHEET**

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## **INTRODUCTION**

Fresh sliced fruit is sold in supermarkets. One of the problems in providing fresh sliced fruit is its limited shelf-life. The fruit goes brown and becomes soft. Scientists have found a number of different treatments which will keep fruit fresh for longer. These treatments include adding ascorbic acid, calcium lactate and cysteine. The scientists investigated the effect of combining these substances into a single treatment.

They first tested the softness of freshly cut pear slices. They tested this by measuring the force needed to push a probe into the cut surface of the pear slice.

They also measured the colour of the pear flesh with a chromameter. This is an instrument which measures the light reflected off a surface. The higher the value, the lighter the colour.

The scientists dipped the pear slices into one of five solutions

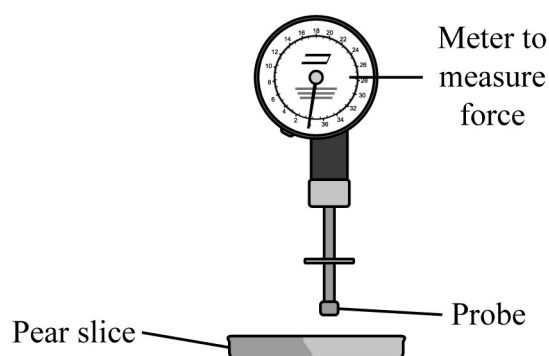
- a control solution
- ascorbic acid
- calcium lactate
- cysteine
- a combination of ascorbic acid, calcium lactate and cysteine.

They kept the pear slices in the solutions for 5 minutes at 20 °C. The slices were then dried and stored at 0 °C. After 10 days the scientists measured the colour and the softness again.

The scientists also carried out a consumer survey on the acceptability of the pear slices.

## **Resource A**

Diagram showing the apparatus used to measure the force required to push a probe into a pear.



## Resource B

Table showing the colour change in the pear slices over 10 days

Solution into which pear slices were dipped	Chromameter reading/ arbitrary units	
	on day 0	on day 10
control	99 ± 1.0	94.0 ± 1.9
ascorbic acid	100 ± 0.9	93.0 ± 2.5
calcium lactate	100 ± 0.7	92.5 ± 2.1
cysteine	100 ± 0.8	95.0 ± 2.7
ascorbic acid + calcium lactate + cysteine	101 ± 1.1	98.5 ± 2.6

(values are means ± 1 standard deviation)

## Resource C

Table showing the change in the softness of the pear slices over 10 days

Solution into which pear slices were dipped	Force required to push the probe into the pear / newtons	
	on day 0	on day 10
control	7	5.5 ± 0.4
ascorbic acid	7	5.0 ± 0.6
calcium lactate	7	8.0 ± 0.7
cysteine	7	5.5 ± 0.4
ascorbic acid + calcium lactate + cysteine	7	9.0 ± 0.7

(values are means ± 1 standard deviation)

## Resource D

Consumers were asked if the pear slices which had been treated with a combination of ascorbic acid, calcium lactate and cysteine had an acceptable appearance and flavour.

Results of consumer survey

84% stated the pears had an acceptable appearance

72% stated the pears had an acceptable flavour.



**SECTION B**

These questions are about an investigation similar to yours.  
You should use the information on the resource sheet to answer the questions.

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

Use **Resource A** to answer this question.

- 8** Give **one** factor which should have been kept constant when measuring the softness of the pear slice with the probe.

.....  
*(1 mark)*

Use **Resources B** and **C** to answer these questions.

- 9** (a) Suggest how the control in this investigation should have been carried out.

.....  
.....  
.....  
.....  
*(2 marks)*

- (b) Explain why a control was included in this investigation.

.....  
.....  
*(1 mark)*

- 10** (a) Which solution was most effective at preventing the browning of the pear slices?  
Give the evidence for your answer.

.....  
.....  
.....  
*(2 marks)*

- (b) In which solution was there the greatest variation in the colour change after 10 days? Give the evidence for your answer.

.....

.....

.....

.....

*(2 marks)*

- (c) It is not possible to conclude that the combination of all three substances is more effective at preventing softness than the calcium lactate alone. Use the data to explain why.

.....

.....

*(1 mark)*

- (d) The initial chromameter readings varied. Suggest an explanation for the variation in these readings.

.....

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*(1 mark)*

**11** (a) Twenty slices of pear were used for each treatment. Explain why.

.....  
.....  
.....  
.....

*(2 marks)*

(b) The scientists used a number of different pears to get sufficient slices for all the tests. Describe how they could have taken this factor into account when selecting samples for each test.

.....  
.....

*(1 mark)*

**12** The scientists left the cut pieces of pear at 0°C for the 10 day period because this is the temperature used to store pears commercially. Explain why this temperature is used to store pears commercially.

.....  
.....  
.....  
.....  
.....  
.....

*(3 marks)*

**13** The information given in **Resource D** is insufficient for a decision to be made about the acceptability of the treated pears. In what way is the information insufficient?

.....

.....

.....

.....

*(2 marks)*

**14** Suggest what additional information should be obtained before a decision is made on whether to use any of these treatments on human food.

.....

.....

*(1 mark)*

**Total 19 marks**

**END OF QUESTIONS**



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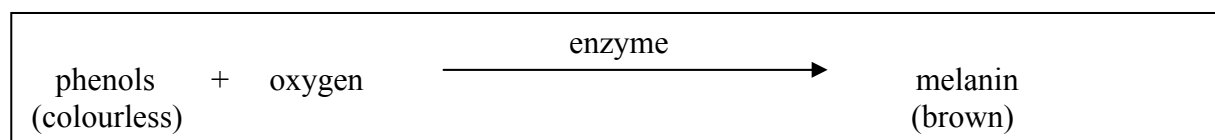
**The effect of pH on the browning of apples**

**INTRODUCTION**

When apples are cut or bruised, their flesh changes colour. It slowly turns brown.

The production of the brown colour is the result of an enzyme-controlled reaction. The enzyme converts colourless phenols on the exposed surface of the apple into a brown pigment called melanin. This reaction also requires oxygen.

The reaction is summarised by the equation



This reaction may be prevented or stopped by dipping the cut surface of the apple in lemon juice.

You are required to investigate the effect of pH on the rate of browning of apples.

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## The effect of pH on the rate of browning of apples

### Outline method

#### A Setting up a standard

(You may ask for help from your teacher for this part)

You should first set up a standard for comparison by cutting a piece of apple. This piece of apple should be left in the air to turn light brown.

When the apple has turned light brown dip it in lemon juice. Cover it with cling film to prevent any further change in colour.

#### B Carrying out the investigation

(Your teacher will not give you help with this part)

You are provided with 5 buffer solutions each with a different pH.

For each pH value

1. cut a piece of apple.
2. dip the piece of apple into a buffer solution of the required pH.
3. remove it and drain off the excess buffer.
4. leave it in air as oxygen is required for the reaction to occur.
5. measure the time taken for the cut surface of the apple to reach the same brown colour as the standard.

In this investigation you should decide for yourself

- how many repeats of each value of pH to take
- which variables to control or monitor.