



General Certificate of Secondary Education  
2024

Centre Number

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Candidate Number

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# Double Award Science Biology

Unit 7: Practical Skills

Booklet A  
Higher Tier



\*GDW75\*

[GDW75]

## TIME

1 hour.

## INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.  
Write your answers in the spaces provided in this question paper.  
Answer **all** parts of Question 1.

## INFORMATION FOR CANDIDATES

The total mark for this paper is **15**.  
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.  
Follow all health and safety instructions.  
The apparatus and materials required to complete the task are provided.  
**You will require a calculator.**

| For Examiner's use only | Mark | Remark |
|-------------------------|------|--------|
| Biology (15 marks)      |      |        |
| Chemistry (15 marks)    |      |        |
| Physics (15 marks)      |      |        |
| Total (45 marks)        |      |        |

| For Examiner's use only |       |
|-------------------------|-------|
| Question Number         | Marks |
| 1                       |       |

| Total Marks |  |
|-------------|--|
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## Investigating the effect of temperature on the action of an enzyme

Milk contains protein.

Protease is an enzyme that breaks down protein.

When protease breaks down protein in milk solution, the milk solution turns from **white** to **colourless**.

**You must wear eye protection when carrying out this investigation.**

On your bench you have:

- Eye protection
- 1 small beaker of protease solution
- 1 small beaker of milk solution
- 1 large beaker of water at 20 °C (waterbath)
- 1 large beaker of water at 40 °C (waterbath)
- 1 test tube rack
- 4 test tubes labelled 1, 2, 3 and 4 (test tubes 1 and 2 have an 'X' on the back)
- 2 syringes (one labelled M for milk solution and one labelled P for protease solution)
- 1 stirring rod
- 1 timer

## Instructions

- 1 Put 2 cm<sup>3</sup> of protease solution into test tubes **1** and **2** using the syringe labelled P.
- 2 Put 5 cm<sup>3</sup> of milk solution into test tubes **3** and **4** using the syringe labelled M.
- 3 Place test tubes:
  - **1** and **3** into the 20 °C waterbath
  - **2** and **4** into the 40 °C waterbath
- 4 Leave all the test tubes in the waterbaths for at least **five** minutes.

- 5 Remove test tubes **2** and **4** from the 40 °C waterbath and place them in the test tube rack.
- 6 Add the contents of test tube **4** to test tube **2** (which has an **X** on the back). Use the stirring rod to stir the solution and start the timer **immediately**.
- 7 Time how long it takes until you can see the **X** through the solution in the test tube. This is the time taken for the solution to turn colourless.
- 8 Record this time (in minutes and seconds) in the column 'My group time in minutes and seconds' in the table opposite, for 40 °C.

[1]

- 9 Reset the timer to zero.
- 10 Remove test tubes **1** and **3** from the 20 °C waterbath and place them in the test tube rack.
- 11 Add the contents of test tube **3** to test tube **1** (which has an **X** on the back). Use the stirring rod to stir the solution and start the timer **immediately**.
- 12 Time how long it takes until you can see the **X** through the solution in the test tube. This is the time taken for the solution to turn colourless.
- 13 Record this time (in minutes and seconds) in the column 'My group time in minutes and seconds' in the table opposite, for 20 °C.

[1]

- 14 Convert both times recorded in your table from minutes and seconds into seconds.  
**Show your working.**

- 15 Record these times in the table in the column 'My group time /s'.

[2]

**16** Collect results for the times in **seconds** at 40 °C and 20 °C from one other group.

**17** Record these times in the column 'Group 2 time /s' in the table.

[1]

**You must complete the remainder of the paper on your own.**

**18** Calculate the average time in seconds taken for the solution to turn colourless at each temperature.

**Show your working.**

**19** Record these results in the column 'Average time /s' in the table.

[2]

**1 (a)**

| Temperature /°C | Time taken for the solution to turn colourless |                  |                 |                 |
|-----------------|------------------------------------------------|------------------|-----------------|-----------------|
|                 | My group time in minutes and seconds           | My group time /s | Group 2 time /s | Average time /s |
| 40              |                                                |                  |                 |                 |
| 20              |                                                |                  |                 |                 |

Examiner Only

Marks Remark

- (b)** The milk and protease solutions were left in the waterbaths for at least five minutes during step 4.

Explain why.

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[1]

- (c)** The milk and protease solutions were stirred during steps 6 and 11.

Explain why.

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[1]

- (d)** Name **two** variables that were controlled during this investigation.

1. \_\_\_\_\_

2. \_\_\_\_\_ [2]

- (e)** Describe the difference in the average time taken for the solution to turn colourless at 40 °C and 20 °C.

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[1]

| Examiner Only |        |
|---------------|--------|
| Marks         | Remark |
|               |        |

- (f) Another student carried out a similar investigation over a wider range of temperatures.

She recorded the time taken for the solution to turn colourless. The table shows the results of her investigation.

| Temperature / °C | Time taken for the solution to turn colourless / minutes |
|------------------|----------------------------------------------------------|
| 10               | 10.0                                                     |
| 20               | 8.5                                                      |
| 30               | 5.0                                                      |
| 40               | 6.0                                                      |
| 50               | 9.0                                                      |
| 60               | 20.0                                                     |

Circle **one** statement in each of the boxes, **A**, **B**, and **C**, which is correct for the student's results.

**Box A**

The **time taken** for the solution to turn colourless

- decreased up to a temperature of 30 °C.
- decreased at all temperatures higher than 10 °C.
- decreased at temperatures higher than 40 °C.

**Box B**

The student predicted that **the rate of the reaction** would increase as the temperature increased.

- This was true for temperatures up to 30 °C.
- This was true for all temperatures.
- This was true for temperatures higher than 40 °C.

**Box C**

The **correct** explanation for the result at 50 °C was that

- none of the enzyme had denatured.
- some of the enzyme had denatured.
- all of the enzyme had denatured.

[3]

| Examiner Only |        |
|---------------|--------|
| Marks         | Remark |
|               |        |

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**THIS IS THE END OF THE QUESTION PAPER**

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