Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2024

Double Award Science
Biology

Unit 7: Practical Skills

Booklet A
Foundation Tier

GDW71

[GDW71]

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

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	
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^3 of protease solution into test tubes **1** and **2** using the syringe labelled P.

2 Put 5 cm^3 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)

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

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

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

Description _____

_____

Explanation _____

_____

_____

_____ [3]

(c) Another student carried out a similar investigation to find the optimum temperature of the protease enzyme.

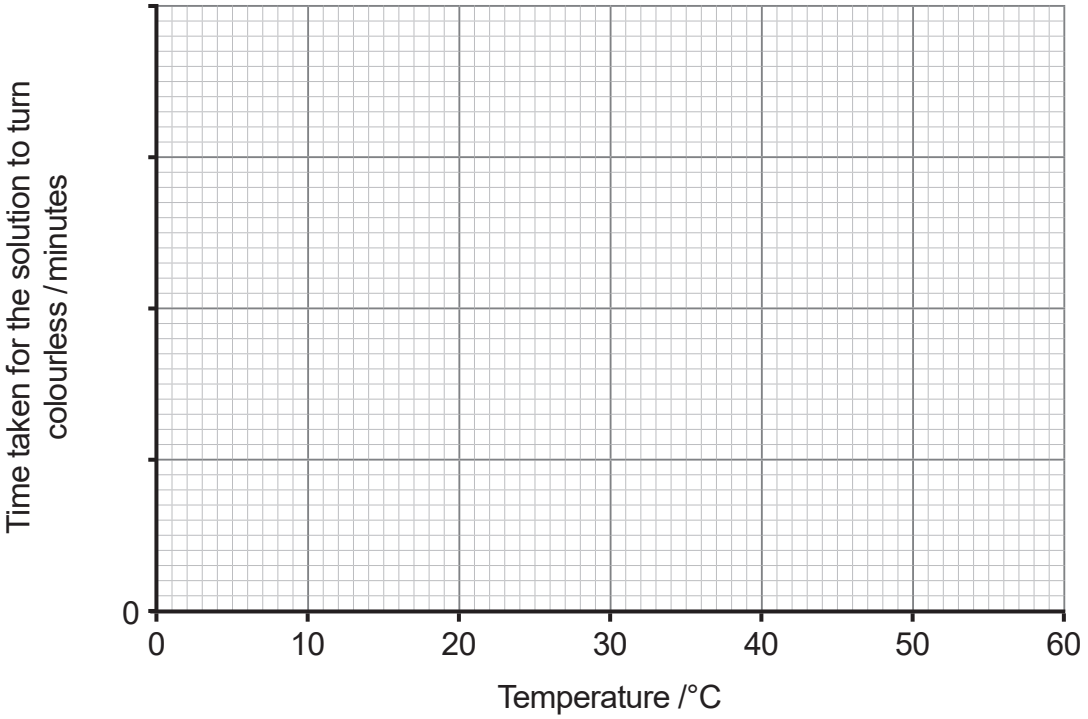
She recorded the time taken for the solution to turn colourless.

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	19.0

Use the table opposite to:

- complete the scale for the y-axis on the grid
- plot a **line graph** of the results on the grid.



[4]

(d) Use the graph to give the optimum temperature of the protease enzyme.

_____ °C [1]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only	
Marks	Remark

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