

Centre Number						Candidate Number				
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For Examiner's Use Total Task 1



General Certificate of Education
Advanced Level Examination
June 2010

Human Biology

HBI6X/PM1

**Unit 6X A2 Externally Marked Practical Assignment
Task Sheet 1**

To be completed before Task Sheet 2

For submission by 15 May 2010

For this paper you must have:

- a ruler with millimetre measurements
- a calculator.

The use of the enzyme urease by bacteria in the stomach

Introduction

Some species of bacteria cause diseases of the stomach. Most bacteria are killed by acidic gastric juice. Gastric juice is produced by the stomach lining. Some species of bacteria survive the antibacterial action of gastric juice by secreting the enzyme urease. This enzyme catalyses a reaction that produces ammonia. The ammonia neutralises the acid in gastric juice.

Phenol red is a pH indicator that turns from yellow in acidic conditions to pink-red in alkaline conditions.

Task 1 – Finding a suitable concentration of urease to use

In this task, you will find the concentration of urease that produces a result in a suitable time so that you can use this in Task 2.

Materials

You are provided with

- phenol red solution
- 5% urease solution
- 1% urea solution
- hydrochloric acid
- distilled water
- a large beaker that you can use as a water bath, or access to a thermostatic water bath
- thermometer
- small beakers
- test tubes
- test-tube rack
- timer
- graduated pipettes or syringes
- dropping pipettes
- marker pen.

You may ask your teacher for any other apparatus you require.

Outline method

Read these instructions carefully before you start your investigation.

1. Set up a water bath at room temperature.
2. Label six test tubes A to F.
3. Put 1 cm³ 5% urease in tube A.
4. Use the 5% urease solution and distilled water to make urease solutions of concentrations 4%, 3%, 2% and 1%.
5. Set up tubes B to F.
 - Tube B should contain 1 cm³ 4% urease solution.
 - Tube C should contain 1 cm³ 3% urease solution.
 - Tube D should contain 1 cm³ 2% urease solution.
 - Tube E should contain 1 cm³ 1% urease solution.
 - Tube F should contain 1 cm³ distilled water.
6. Place tubes A to F in the water bath.
7. Label another six test tubes 1 to 6.
8. Add 5 cm³ urea solution to each tube.
9. Add 2 drops of phenol red and 1 drop of hydrochloric acid to each of tubes 1 to 6 and place all six tubes in the water bath.
10. After a suitable time, add the contents of tube 1 to tube A, quickly mix the contents and start the timer.
11. In the table below, record how long it takes for the phenol red to turn from yellow to pink-red.
12. Repeat steps 10 and 11 but add the contents of tube 2 to tube B, then tube 3 to tube C, then tube 4 to tube D, then tube 5 to tube E and finally tube 6 to tube F.
13. Tube F will act as a control experiment.

You will need to decide for yourself

- how to make the different concentrations of urease solution
- how long to leave the test tubes in the water bath before mixing
- when the colour change has occurred.

Recording your results

Record your results in the table.

Tube	Percentage concentration of urease	Time taken for phenol red to turn pink-red / seconds
A	5	
B	4	
C	3	
D	2	
E	1	
F	0	

Turn over ►

Questions on Task 1

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

- 1** Complete the headings on the table and the empty boxes to show how you made the different concentrations of urease solution.

Percentage concentration of urease solution	Volume of water /.....	Volume of 5% urease solution /.....
4		
3		
2		
1		

(2 marks)

- 2** Urease catalyses the reaction



What name is given to the type of reaction that urease catalyses?

.....
(1 mark)

- 3 (a)** You left tube 1 and tube A for a time in the water bath before mixing their contents. Explain why.

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

- 3 (b)** You were told to place the test tubes in a water bath at room temperature. Do you think it was necessary to use a water bath? Explain your answer.

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

3 (c) Describe how you monitored the temperature of the water bath.

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

4 What was the purpose of using tube F as a control?

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

5 Use your data to suggest the urease concentration that you will use in Task 2.
Explain why you chose this concentration.

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

6 pH is a factor that affects enzyme activity. Do you think a buffer solution should have been added to the contents of the tubes before mixing?
Explain your answer.

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

END OF TASK 1

There are no questions printed on this page

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