

Manipulation of Measure

..... Question Paper

| | |
|------------|--------------------------------------|
| Level | Pre U |
| Subject | Biology |
| Exam Board | Cambridge International Examinations |
| Topic | Manipulation of Measure |
| Booklet | Question Paper |

Time Allowed: **minutes**

Score: **/**

Percentage: **/100**

- 1 You should read through the whole of this question carefully and then plan your use of the time to make sure that you finish all the work that you would like to do.

The enzyme lipase catalyses the hydrolysis of ester bonds in triglycerides. Its activity is affected by the presence of bile salts.

Full fat milk will be used as the source of triglycerides.

You are to investigate the effect of different concentrations of bile salts on the rate of hydrolysis of triglycerides in milk.

You are provided with a 1% solution of lipase and a 5% solution of bile salts.

Proceed as follows.

- 1 Use the syringes and the small beakers to prepare a number of different concentrations of bile salts using the 5% bile salts solution and water provided. You will need a maximum of 10 cm³ of each bile salts solution.

(a) Complete the table below to show how you have prepared the different solutions.

| final concentration of bile salts / % | volume of 5% bile salts solution / cm ³ | volume of water / cm ³ |
|---------------------------------------|--|-----------------------------------|
| | | |

[3]

(b) Suggest suitable controls for this experiment.

.....

.....

.....

.....

[2]

- 2 Label test-tubes with the concentrations of bile salts that you have prepared.
- 3 Prepare the labelled test-tubes with milk, sodium carbonate solution, bile salts solutions and thymolphthalein solution, using the following quantities:
 - 5.0 cm³ of milk
 - 5.0 cm³ of sodium carbonate solution
 - 1.0 cm³ of the appropriate bile salts solution
 - three drops of thymolphthalein.
- 4 Label a test-tube or test-tubes with the control or controls that you have decided to use, and prepare these appropriately
- 5 Put a bung into each test-tube in turn and invert twice so that the contents are a uniform blue colour.
- 6 Put some warm water in a beaker to act as a water-bath. The beaker should be about half-full. Adjust the temperature of the water to 50 °C (± 2 °C).
- 7 Place the test-tubes prepared in steps 3 and 4 into the water-bath.
- 8 Stir the lipase solution with the glass rod provided. Put 2.0 cm³ of the lipase solution into as many labeled, clean test-tubes as you need for the concentrations of bile salts that you are testing and your controls. Place them in the water-bath.
- 9 Prepare the space on page 4 to record your results.

(c) (i) As pH falls, the blue colour of the thymolphthalein will fade until it is colourless.

Describe how this is used to gain information about the rate of hydrolysis of the lipid in the milk by lipase.

.....

.....

.....

.....

.....

.....

..... [3]

(ii) Measure and record the temperature in the water-bath at appropriate points during the experiment. Record your measurements in the space below.

10 After all the test-tubes have been in the water-bath for at least **five minutes**, add the lipase solution, from each test-tube, to the test-tubes containing the milk and bile salts solutions, and, where appropriate, to the control test-tubes as well.

Immediately after adding the lipase solution insert a bung into each test-tube and invert twice to mix the contents.

(d) You should record your results in a logical way, to show the effect of bile salts on the rate of triglyceride hydrolysis by lipase in the space below.

Record and justify any further decisions that you make about your investigation in the space below the table.

.....

.....

.....

.....

.....

.....

- (e) Plot a graph of your results on the grid below to show the effect of the concentration of bile salts on the rate of hydrolysis of triglycerides.



