

The Origin and Evolution of Life

Question Paper

Level	Pre U
Subject	Biology
Exam Board	Cambridge International Examinations
Topic	The Origin and Evolution of Life
Booklet	Question Paper

Time Allowed: 22 minutes

Score: /18

Percentage: /100

- 1 You are reminded that you should allow **35 minutes** for question 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.

You are to investigate the production of glucose from lactose in milk by immobilised lactase.

Lactase catalyses the hydrolysis of the glycosidic bond in lactose.

You are provided with beads of immobilised lactase. Two 10 cm³ syringes have been set up with beads of immobilised lactase already added, as in Fig. 1.1. A third empty syringe barrel is available to use as follows:

- 1 Use the spatula to transfer beads to the syringe barrel that has been prepared for you.
- 2 Make sure that the clips on the plastic tubing are closed tightly before starting the investigation.

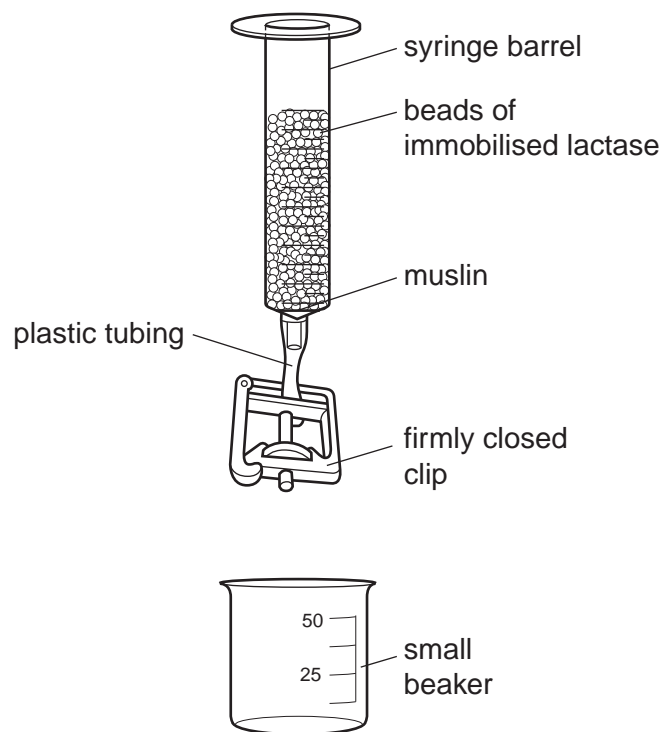








Fig. 1.1

Diastix[®] test strips turn different colours depending on the concentration of **glucose** in the test liquids.

You are provided with a **colour chart** to show how to interpret the colours of the strips in terms of the concentrations of glucose in the test liquids.

Use the Diastix[®] test strips in the following way:

- dip a strip into the liquid to be tested and remove immediately
- shake off any liquid that remains attached to the coloured strip
- place on a white tile and start a stopwatch or stop clock
- after 30 seconds, match the colour of the test strip with the colour chart and note the glucose concentration in $\text{g } 100 \text{ cm}^{-3}$
- ignore any colour changes that occur after 30 seconds.

						
glucose concentration / $\text{g } 100 \text{ cm}^{-3}$	0	0.10	0.25	0.50	1.00	≥ 2.00

- (a) Use the apparatus shown in Fig. 1.1 to investigate how changing the length of time that milk is in contact with immobilised lactase affects the production of glucose.

In a previous investigation, using this equipment, complete hydrolysis of the lactose occurred within 10 minutes.

You should present and record your observations and data in a clear, organised and logical way in the space provided below.

- (c) A student investigated the effect of temperature on the activity of soluble and immobilised lactase.

The student's results are shown in Table 1.1.

Table 1.1

temperature/°C	relative enzyme activity/percentage of maximum activity							
	soluble lactase				immobilised lactase			
	1	2	3	mean	1	2	3	mean
15	16	18	18	17.3	29	25	27	27.0
20	21	22	25	22.7	36	34	33	34.3
25	33	35	29	32.3	51	53	46	50.0
30	47	45	43	45.0	67	63	65	65.0
35	65	59	58	60.7	92	88	90	90.0
40	76	77	75	76.0	100	100	100	100.0
45	100	100	99	99.7	96	93	96	95.0
50	69	70	65	68.0	23	27	28	26.0
55	29	33	31	31.0	12	18	14	14.7

- (i) State what should be calculated in order to assess the reliability of the data collected for each temperature.

..... [1]

- (ii) Using the results shown in Table 1.1, compare the effect of temperature on the relative enzyme activities of soluble and immobilised lactase.

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 [3]