8 Phenolphthalein is an indicator. It is pink in alkaline solutions and turns colourless as the pH decreases.

It can be used to measure the activity of the enzyme lipase on the breakdown of lipids.

Samples of milk containing phenolphthalein were incubated with lipase at different temperatures.

The time taken for the phenolphthalein to turn colourless was recorded and used to calculate the rate of enzyme activity.

Figure 10 shows these results.

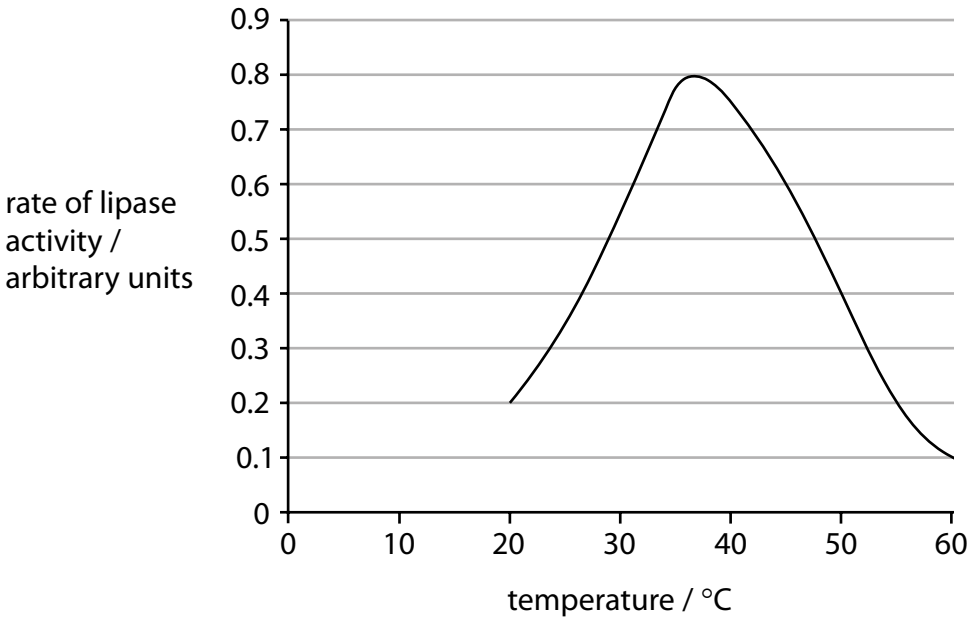

Figure 10

(a) (i) Explain why phenolphthalein turns colourless when lipase breaks down the lipids in milk.

(2)

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(ii) Describe the effect of temperature on the activity of lipase, as shown in Figure 10.

(2)

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(iii) Explain why the activity of lipase changes above a temperature of 40 °C.

(2)

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(b) A student investigated the time taken for amylase to breakdown a 10% starch solution into glucose at 37 °C. The student repeated the investigation five times.

Figure 11 shows the results.

time taken for amylase to produce glucose (s)				
test 1	**test 2**	**test 3**	**test 4**	**test 5**
120	125	110	115	118

Figure 11

(i) Calculate the rate of amylase enzyme activity for the 10% starch solution.

(3)

rate = ... s^{-1}

The investigation was done at 37 °C.

(ii) State **one** other variable that the student should have controlled during this investigation.

(1)

.....

.....

(c) Different enzymes catalyse specific reactions.

Explain why enzymes can only catalyse specific reactions.

(2)

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(Total for Question 8 = 12 marks)

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Probiotic bacteria

3 The digestive system is made up of a number of different organs.

(a) Define the term **organ**.

(1)

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.....

(b) (i) How many of the statements are correct?

- The low pH of the stomach kills bacteria.
- The low pH of the stomach provides optimum conditions for pepsin activity.
- The pH of the stomach is low so that acid digests protein.

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** none

☒ **B** 1

☒ **C** 2

☒ **D** 3

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

Protein is broken down to form

(1)

☒ **A** amino acids

☒ **B** fatty acids

☒ **C** glucose

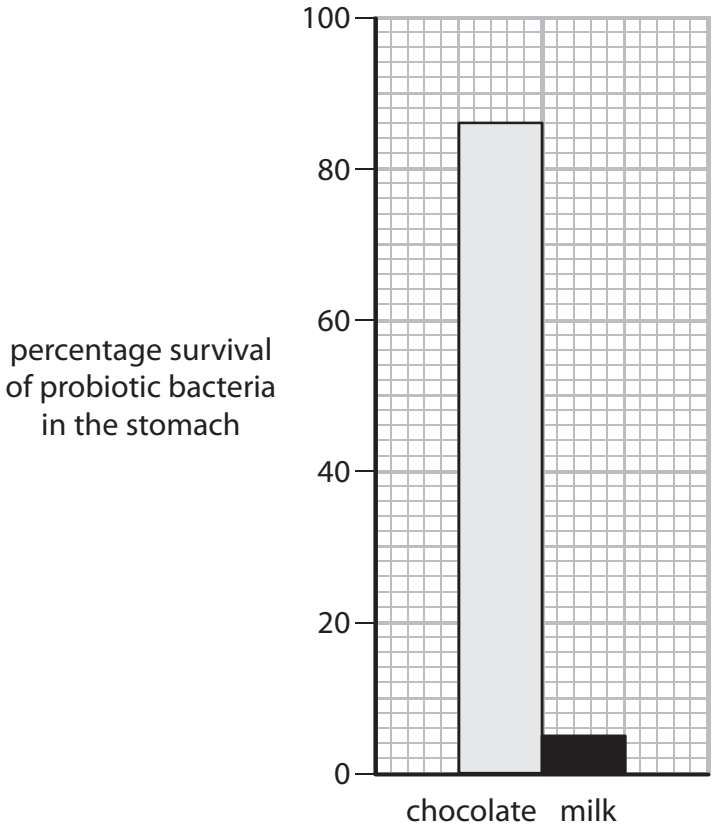
☒ **D** glycerol

(c) Explain how the structure of villi allows efficient absorption of the soluble products of protein digestion.

(4)

(d) Probiotic bacteria are thought to be beneficial to health.
Probiotic bacteria can be consumed in chocolate and milk.

The graph shows the percentage survival of probiotic bacteria in the stomach.



(i) The total number of live bacteria in the chocolate was five million.

Calculate the number of live bacteria from the chocolate that survived in the stomach.

(2)

answer = ...

(ii) Suggest a reason for the survival differences of probiotic bacteria in chocolate compared with probiotic bacteria in milk.

(1)

.....

.....

(Total for Question 3 = 10 marks)

Digestive enzymes

4 The table shows some of the enzymes involved in the digestion of starch, protein and fat, in three parts of the digestive system.

part of digestive system	substance digested	enzyme	products of digestion
mouth	starch	P	simple sugars
stomach	protein	R	molecule W
small intestine	fat	S	molecules Y and Z
	starch	Q	simple sugars

(a) Complete the sentences by putting a cross (☒) in the box next to your answer.

(i) Enzyme Q is produced by the

(1)

☒ **A** large intestine

☒ **B** liver

☒ **C** oesophagus

☒ **D** pancreas

(ii) Molecules Y and Z are

(1)

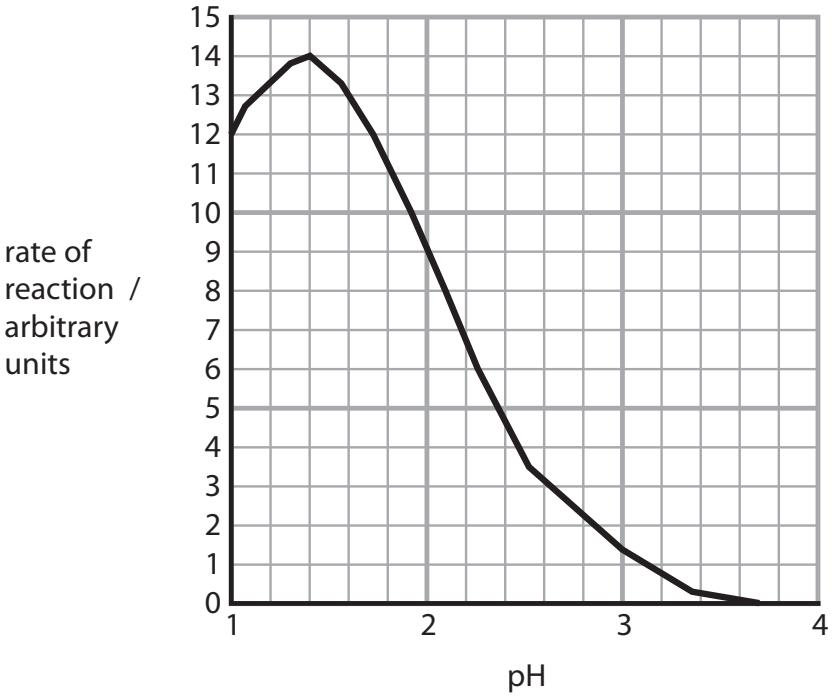
☒ **A** fatty acids and glucose

☒ **B** fatty acids and glycerol

☒ **C** lactic acid and glucose

☒ **D** lactic acid and glycerol

(b) The graph shows how pH affects the rate of the reaction catalysed by enzyme R.



(i) Name enzyme R.

(1)

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(ii) The rate of reaction can be determined by measuring how quickly molecule W is formed.

Name molecule W.

(1)

.....

(iii) Calculate the difference in the rate of the reaction between pH 1 and pH 2.

(2)

answer = ... arbitrary units

(iv) Suggest why this enzyme works better at pH 1 than at pH 2.

(2)

(c) Explain the roles of bile in digestion.

(2)

(Total for Question 4 = 10 marks)

Digestion

5 (a) Complete the sentence by putting a cross (☒) in the box next to your answer.

Food is moved through the digestive system by

(1)

- ☒ **A** diffusion
- ☒ **B** digestion
- ☒ **C** peristalsis
- ☒ **D** active transport

(b) State **two** roles of bile in digestion.

(2)

1 .....

.....

2 .....

.....

*(c) Describe the roles of the enzymes involved in digestion.

(6)

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(d) Explain how the structure of the villi allows efficient absorption in the small intestine.

(3)

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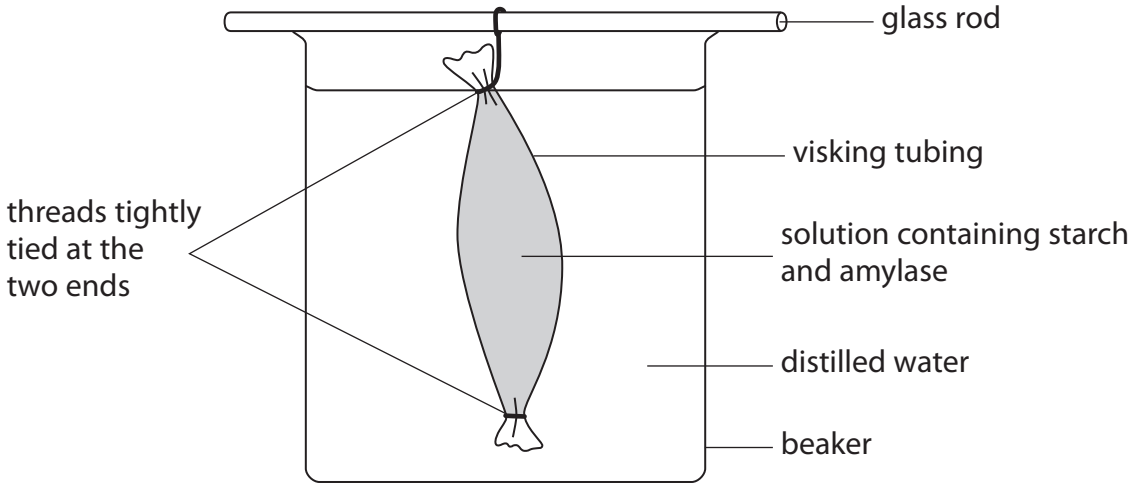
(Total for Question 5 = 12 marks)

Using visking tubing

5 Visking tubing is made of a plastic material through which small molecules can pass.

The diagram shows how the equipment for an investigation using visking tubing was set up.



(a) In this investigation, the concentration of glucose in the distilled water was measured at the start and then every five minutes.

The results are shown in the table.

time of measuring the glucose concentration in the distilled water / mins	concentration of glucose in the distilled water / g cm^{-3}
0	0.00
5	0.07
10	0.39
15	0.52
20	0.79
25	0.79

(i) Describe the results of this investigation.

(2)

(ii) Explain the results of this investigation.

(3)

*(iii) The diagram shows how visking tubing can be used to model the small intestine.

This model does not fully represent the structure and functions of the small intestine.

Evaluate the strengths and weaknesses of this model.

(6)

(b) Complete the sentence by putting a cross (☒) in the box next to your answer.

The function of the gall bladder is to

(1)

☒ **A** make bile

☒ **B** make lipase

☒ **C** store bile

☒ **D** store lipase

(Total for Question 5 = 12 marks)