Enzymes

Total Mark – 16

Question: 1

3 (a) What is an enzyme?

[2 marks]

_____

_____

_____

_____

3 (b) Enzymes are sometimes used in the home and in industry.

Draw **one** line from each enzyme to the correct use of that enzyme.

[3 marks]

Enzyme	Use of enzyme
Protease	Removes grease stains from clothes
Lipase	Pre-digests protein in some baby foods
Isomerase	Breaks down DNA in genetic fingerprinting
	Changes glucose syrup into fructose syrup

3 (c) Fructose and glucose are two types of sugar.

Fructose tastes much sweeter than glucose. This means that a smaller amount of fructose can be used to give the same sweetness.

3 (c) (i) Why is it an advantage to use fructose instead of glucose in **slimming** foods?

[1 mark]

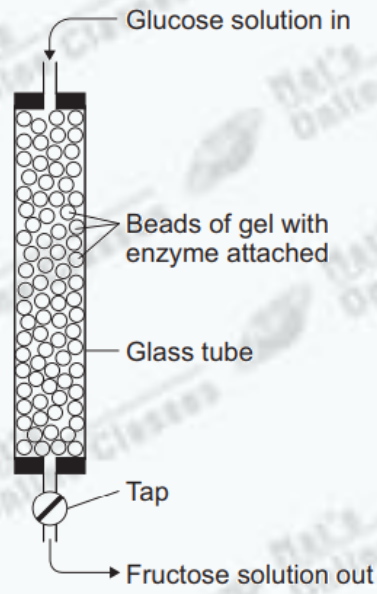
_____

_____

3 (c) (ii) **Figure 3** shows how an enzyme can be used to change glucose into fructose.

The enzyme molecules are firmly attached to beads of gel in a glass tube.

Figure 3



Give **two** advantages of attaching the enzyme to beads of gel.

[2 marks]

Tick (✓) **two** boxes.

Tick (✓) **two** boxes.

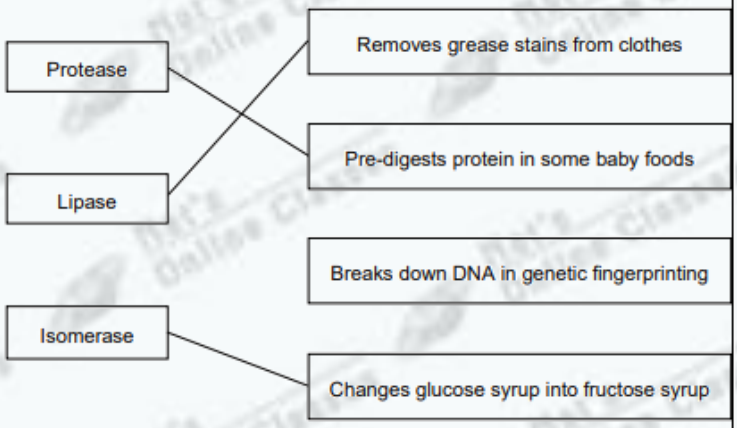
The enzyme can be used for more than one type of reaction. ☐

The enzyme can easily be used again. ☐

The enzyme would be denatured. ☐

The fructose solution produced does not have any enzyme in it. ☐

There is less contact between the enzyme and the glucose. ☐

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)	a catalyst **or** speeds up a reaction any **one** from: • a protein • it is specific • sensitive to pH **or** temperature • not used up (in the reaction)	allow 'biological catalyst' for 2 marks	1 1	AO1 2.5.1a/b
3(b)	 extra lines cancel		3	AO1 2.5.2f/i
3(c)(i)	less energy **or** few(er) calories (for the same sweetness)	ignore less fattening ignore ref. to cost	1	AO2 2.5.2i
3(c)(ii)	The enzyme can easily be used again. The fructose solution produced does not have any enzyme in it.		1 1	AO3 2.5.2i
Total			**8**	

Question: 2

8 Amylase is an enzyme that breaks down starch.

8 (a) Complete the equation to show the breakdown of starch.

[1 mark]

Starch $\xrightarrow{\text{amylase}}$ _____

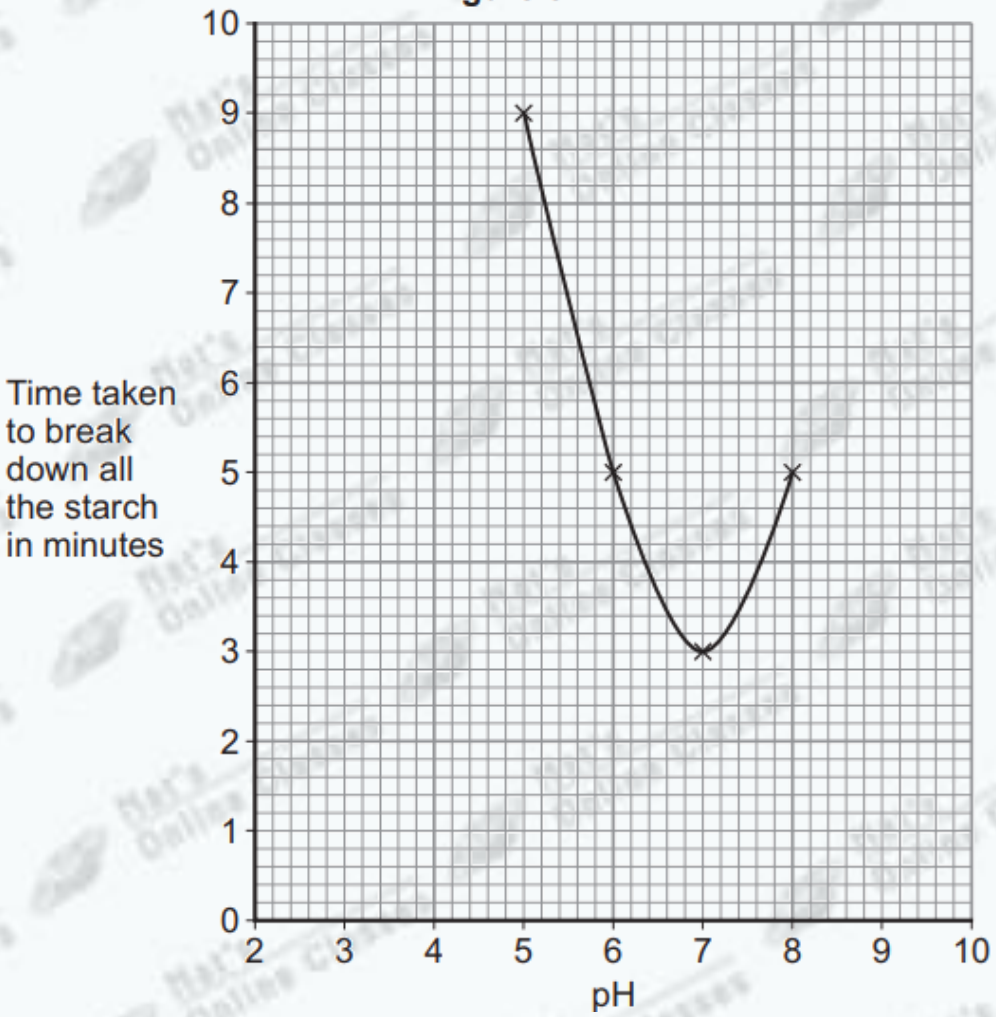
8 (b) Some students investigated the effect of pH on the activity of amylase.

The students:

- put 5 cm^3 of pH5 solution + 1 cm^3 of amylase solution into a test tube
- put 4 cm^3 of starch suspension into a second test tube
- left both test tubes at room temperature for 5 minutes
- mixed the contents of the two test tubes
- removed a small sample of the mixture at 1-minute intervals
- tested each sample for starch
- timed how long it took to break down all the starch
- repeated each of the above steps at pH6, pH7 and pH8.

Figure 9 shows the students' results.

Figure 9



8 (b) (i) Give **two** variables which were controlled in this investigation.

[2 marks]

1 _____

_____

2 _____

_____

8 (b) (ii) The students tested samples of the reaction mixture for starch.
In each test, they added one drop of the reaction mixture to one drop of iodine solution on a white tile.

- Iodine solution = light brown colour
- Iodine solution + starch = dark blue colour

Predict the colour seen in the iodine test on the samples of the pH6 reaction mixture at 4 minutes and at 6 minutes.

[1 mark]

4 minutes _____

6 minutes _____

8 (b) (iii) The students concluded that amylase works best at pH7.
This may **not** be a valid conclusion.

Suggest **two** improvements to the investigation that would increase the validity of the students' conclusion.

[2 marks]

1 _____

_____

2 _____

_____

8 (b) (iv) The students repeated the investigation at pH3.

What result would you expect at pH3?

Give a reason for your answer.

[2 marks]

_____

_____

_____

_____

Question	Answers	Extra information	Mark	AO / Spec. Ref.
8(a)	sugar(s) / glucose	allow maltose do not allow if extra incorrect answers	1	AO1 2.5.2d Prac
8(b)(i)	any **two** from: • volume of pH solution • volume of amylase / enzyme solution • volume of starch / suspension / substrate • time left (before mixing)	allow amount for volume if neither mark given allow 1 mark for volume(s) of solution(s) ignore time between samples ignore ref. to (room) temperature ignore ref. to concentration	2	AO2 2.5.2b Prac
8(b)(ii)	4 minutes: (dark) blue **and** 6 minutes: (light) brown	allow black ignore purple do **not** allow light blue allow yellow / orange	1	AO3 2.5.2b Prac
8(b)(iii)	any **two** from: • take each reading more than once • use colour standards for deciding end-point • test more pH values between 6 and 8 **or** test at smaller pH intervals • test at shorter intervals • same temperature (in a water bath)	ignore take more readings allow compare with another group allow use a colorimeter ignore wider range of pH unqualified allow example – e.g. every half min	2	AO3 2.5.2b Prac
8(b)(iv)	no reaction **or** stays (dark) blue **or** takes >9 minutes enzyme denatured	allow takes longer allow description of denaturing, i.e. shape change allow description of trend on graph	1 1	AO2/3 2.5.2a/b
Total			**8**	