

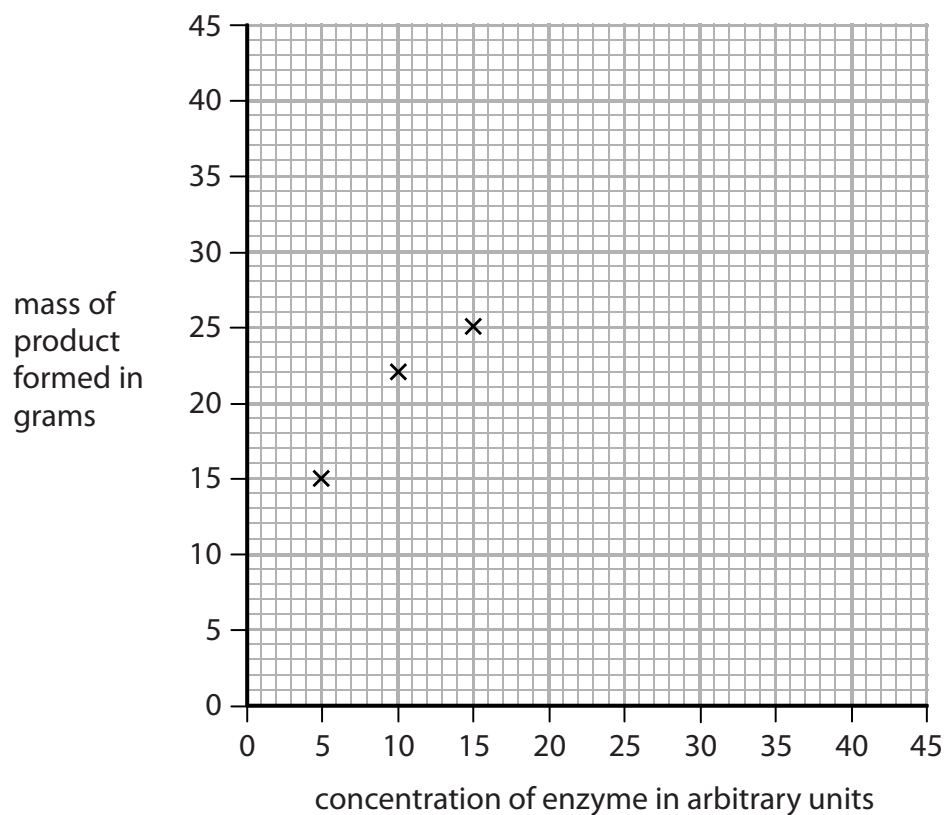
- 1 A student investigated the effect of enzyme concentration on the mass of product formed in one hour.  
 Figure 6 shows the results of this investigation.

concentration of enzyme in arbitrary units	mass of product formed in grams
5	15
10	22
15	25
20	32
25	38
30	40
35	40
40	40

**Figure 6**

- (a) Complete the graph by plotting the points and drawing a line to show the trend in the data.  
 The first three points have been plotted for you.

(2)



(b) Describe the effect that enzyme concentration has on the mass of product formed. (2)

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(c) The ratio of enzyme concentration to the mass of product formed, using an enzyme concentration of 40 arbitrary units, is 1:1.  
Calculate the ratio of enzyme concentration to product formed when the enzyme concentration is 5 arbitrary units. (2)

ratio.....

(d) The investigation used the enzyme pepsin from the stomach, at a temperature of 37°C and at a pH of 7.  
(i) Which statement gives one way to increase the mass of product formed in this investigation? (1)

- A increase the pH
- B decrease the temperature
- C decrease the enzyme concentration
- D increase the substrate concentration

(ii) Explain why a temperature of 80°C was not used in this investigation. (3)

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**(Total for Question 5 = 10 marks)**

2 Proteins are made up of amino acids.

(a) The table shows the DNA bases that code for some of the amino acids found in proteins.

<b>DNA bases</b>	AAA	AAC	CAA	TAC	TTC
<b>Amino acid</b>	phe	leu	val	met	lys

Part of the DNA coding for a protein is:

T A C C A A T T C

(i) State the order of amino acids coded for by this sequence of DNA.

(1)

(ii) These amino acids will be joined together during protein synthesis.

During which stage of protein synthesis will this take place?

(1)

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

Amino acids are joined together

(1)

- A** at the membrane
- B** in the mitochondria
- C** in the nucleus
- D** at the ribosome

(b) DNA can code for the amino acids in the active site of an enzyme.

Explain the role of the active site of an enzyme.

(2)

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(c) Mutations can occur in DNA.

Describe what effect a mutation could have on the action of an enzyme.

(3)

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**(Total for Question 1 = 8 marks)**

3 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.

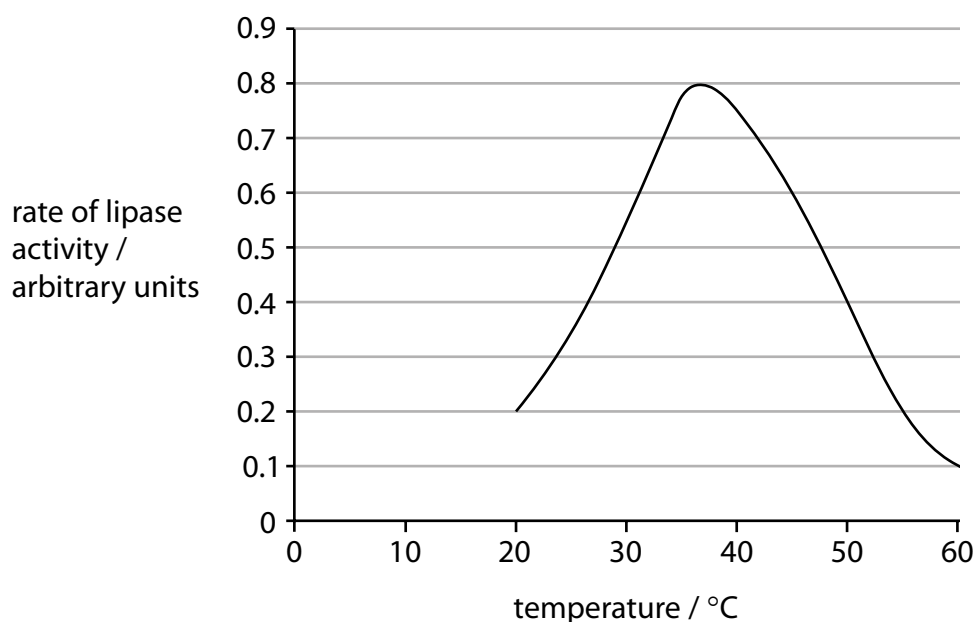


Figure 10

(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.

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

**Figure 11**

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

(3)

rate = ..... s<sup>-1</sup>

The investigation was done at 37°C.

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

(1)

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(c) Different enzymes catalyse specific reactions.

Explain why enzymes can only catalyse specific reactions.

(2)

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**(Total for Question 2 = 12 marks)**

4 DNA and RNA are involved in the synthesis of proteins such as enzymes.

(a) Protein synthesis involves transcription and translation.

Which row shows the molecules involved in both transcription and translation?

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

(1)

	<b>transcription</b>	<b>translation</b>
<input type="checkbox"/> <b>A</b>	tRNA	tRNA
<input type="checkbox"/> <b>B</b>	mRNA	DNA
<input type="checkbox"/> <b>C</b>	tRNA	DNA
<input type="checkbox"/> <b>D</b>	mRNA	mRNA

(b) Describe what happens to the molecule produced by transcription before it is translated.

(2)

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(c) Explain how the lock and key hypothesis models how enzymes work.

You may use labelled diagrams in your answer.

(3)

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