A Level Bridging Work
Biology

The tasks below are designed to support you as you start A Level Biology.

Complete each of the tasks below and bring your work to your first lesson.

Task 1

Write an essay (between 600-700 words) about what you feel are the most important discoveries in biology.

Task 2

During your first few lessons you will complete a project on enzymes and this project will be written up as a report.

To start this report, research enzymes and write an introduction. This should include:

- An overview of the role and action of enzymes
- How enzymes work in terms of the lock and key theory and the induced fit theory. **Challenge** – how are these theories different and which one is more accepted and why?
- What factors can change the rate of enzyme controlled reactions and try to describe the effect each factor has. This could include, but not be limited to, temperature, pH and substrate concentration.
- **A challenge for you** will be to not only describe the effect, but to explain the impact the factor has on the enzyme / the overall reaction. You will want to discuss ideas like bonding and tertiary structure.
- Information about trypsin, the specific enzyme you will use, and casein, the substrate, which is a protein found in milk.

A good report will include sub-headings, diagrams and references. Your reference list should include the author's name, year of publication, publisher and title. If you are unsure, this link will help:
http://www.bbc.co.uk/schools/gcsebitesize/dida/managing_projects/copyrightrev4.shtml

If possible, complete this task using a word processor so you can easily modify and improve your work during later stages of the report.

Task 3

To follow up on this research complete the past paper questions on enzymes. There are questions of differing demand, however, please attempt them all.

Folder

Being organised is a key part to your success at A level.

So you are ready for September please get yourself a folder (preferably a large A4 lever arch style one). This will be for the long term storage of your notes. You may also want a smaller ring binder for your day-to-day notes, which you can bring to all lessons. **Please bring these folders along with your other bridging work to the first lesson.**

Inside your folder, add dividers for the following topics and sub topics:

Year 12 Content

Module 2.1:

- 2.1.1 - Cell Biology
- 2.1.2 - Biological Molecules
- 2.1.3 - Nucleotides & Nucleic Acids
- 2.1.4 - Biological Membranes
- 2.1.5 - Enzymes
- 2.1.6 - Cell Division

Module 3.1:

- 3.1.1 - Exchange surfaces
- 3.1.2 - Animal Transport
- 3.1.4 - Plant Transport

Module 4.1:

- 4.1.1 - Communicable disease
- 4.2.1 - Biodiversity
- 4.2.2 - Classification and Evolution

Year 13 Content

Module 5.1:

- 5.1.1 - Communication and Homeostasis
- 5.1.2 - Excretion
- 5.1.3 - Neuronal Communication
- 5.1.4 - Hormonal Communication
- 5.1.5 - Plant and Animal Responses
- 5.2.1 - Photosynthesis
- 5.2.2 - Respiration

Module 6.1:

- 6.1.1 - Cellular Control
- 6.1.2 - Patterns of Inheritance
- 6.1.3 - Manipulating Genomes
- 6.2.1 - Cloning and Biotechnology
- 6.3.1 - Ecosystems
- 6.3.2 - Populations and Sustainability

Further Biology test questions can be found on our website
https://www.wellswayschool.com/ - Sixth Form – Applying and Enrolment – Bridging Work

GCSE

Q1. (easier)

(a) Enzymes are used in body cells.

(i) What is an enzyme?

Draw a ring around the correct answer.

an antibody **a catalyst** **a hormone**

(1)

(ii) All enzymes are made of the same type of substance.

What is this substance?

Draw a ring around the correct answer.

carbohydrate **fat** **protein**

(1)

(iii) Where is the enzyme amylase produced in the human body?

Draw a ring around the correct answer.

liver **salivary glands** **stomach**

(1)

(b) Enzymes are sometimes used in industry.

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

Enzyme	**Industrial use**
	Changes starch into sugars
Carbohydrase	
	Removes grease stains from clothes
Isomerase	
	Pre-digests proteins in some baby foods
Protease	
	Changes glucose syrup into fructose syrup

(3)

(Total 6 marks)

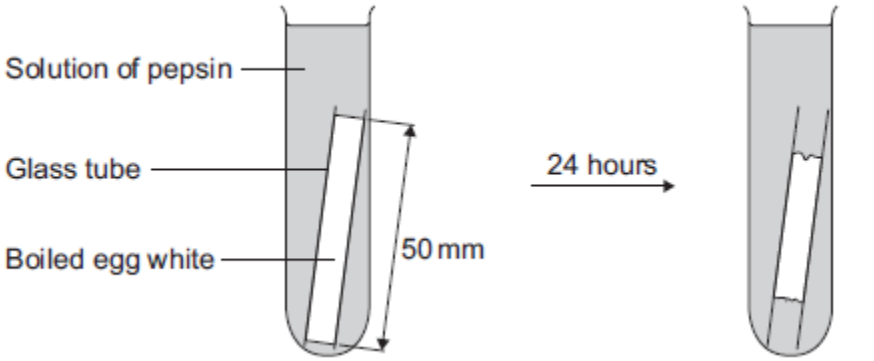
Q2. (medium)

Some students investigated the effect of pH on the digestion of boiled egg white by an enzyme called pepsin. Egg white contains protein.

The students:

- put a glass tube containing boiled egg white into a test tube
- added a solution containing pepsin at pH 7
- set up six more tubes with solutions of pepsin at different pH values
- left the test tubes for 24 hours at room temperature.

The image below shows one of the test tubes, at the start and at the end of the 24 hours.



(a) (i) Name the product of protein digestion.

_____

(1)

(ii) What type of enzyme digests protein?

Tick (✓) **one** box.

amylase ☐

lipase ☐

protease ☐

(1)

(b) The egg white in each tube was 50 mm long at the start of the investigation.
The table below shows the students' results.

pH	Length in mm of boiled egg white after 24 hours
1	38
2	20
3	34
4	45
5	50
6	50
7	50

(i) At which pH did the pepsin work best?

pH _____

(1)

(ii) The answer you gave in part **(b)(i)** may not be the exact pH at which pepsin works best.

What could the students do to find a more accurate value for this pH?

_____

_____

_____

_____

(2)

(iii) There was no change in the length of the egg white from pH 5 to pH 7.

Explain why.

_____

_____

_____

_____

(2)

(c) Pepsin is made by the stomach.

Name the acid made by the stomach which allows pepsin to work well.

_____

(1)

(Total 8 marks)

Q3. (harder)

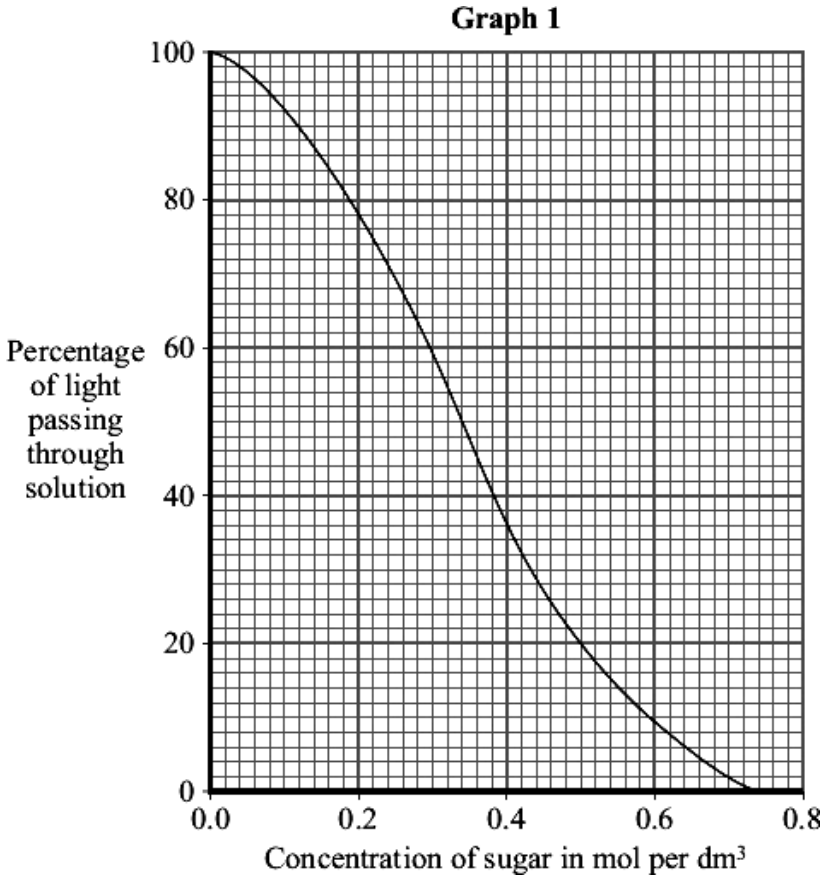
Starch is broken down into sugar by amylase. Amylase is produced in the salivary glands.

(a) Name **two** other organs in the digestive system which produce amylase.

_____ and _____

(2)

(b) A colorimeter measures colour intensity by measuring the percentage of light that passes through a solution.
Graph 1 shows the percentage of light passing through sugar solutions of different concentrations to which a test reagent has been added.



Students used a colorimeter to compare the starch-digesting ability of amylase enzymes obtained from two organs, **P** and **Q**.

- The students collected 5 cm^3 samples of amylase from **P** and **Q** and placed them into a water-bath at 40 °C.
- Two test tubes containing 10 cm^3 samples of starch solution were also placed into the water-bath.
- All the tubes were left in the water-bath for 10 minutes.
- Each amylase sample was added to one of the tubes containing the starch solution.
- The test tubes were placed back into the water-bath.
- Every minute, a few drops were taken from each tube, the test reagent was added and the percentage of light passing through this solution was measured in the colorimeter.

The tubes containing amylase samples and starch solution were left in the water-bath for

ten minutes before the amylase was added to the starch.

Explain why.

_____

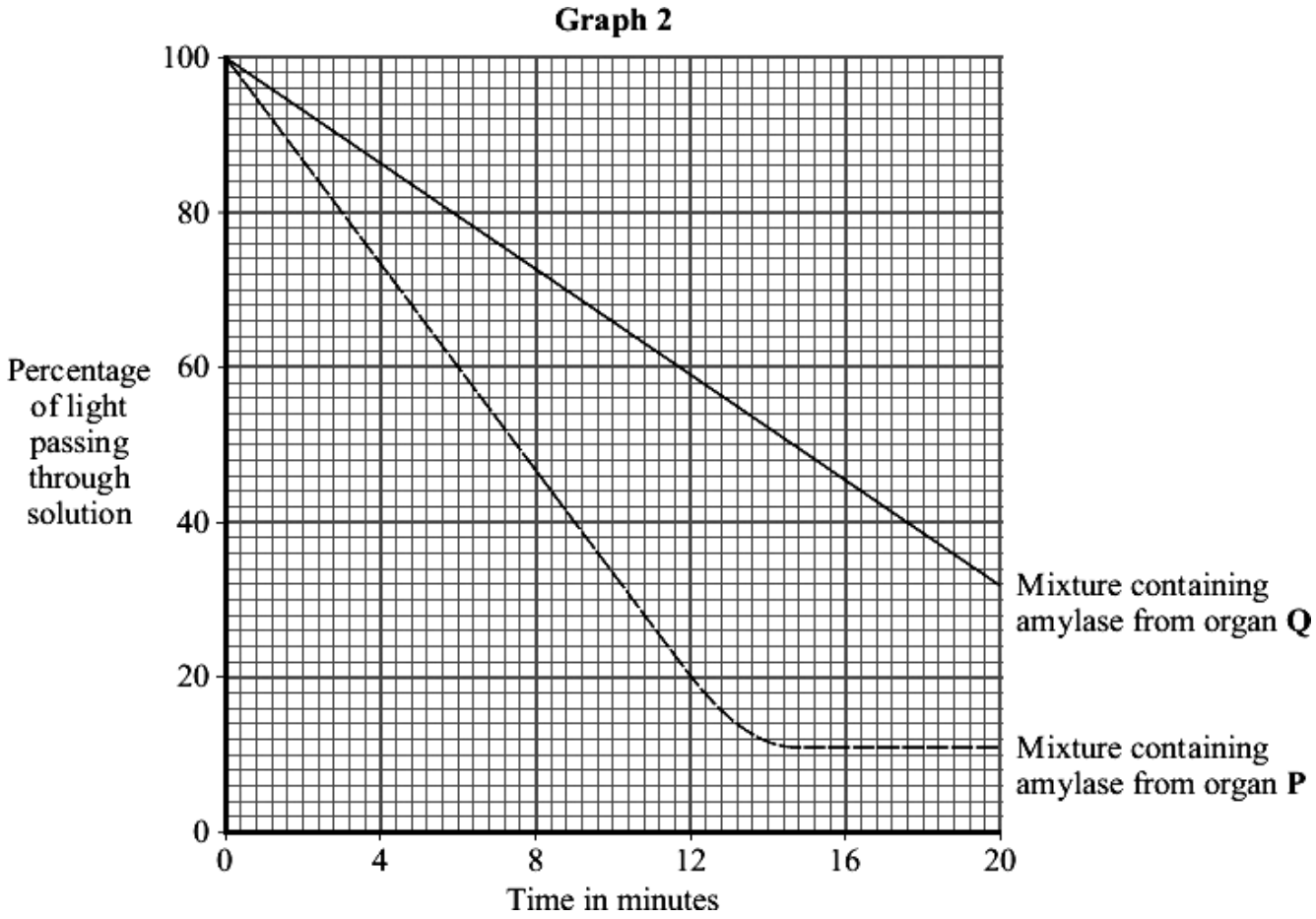
_____

_____

_____

(2)

(c) **Graph 2** shows how the readings from the colorimeter changed over the next 20 minutes.



(i) Use **Graph 1** and **Graph 2** to determine the concentration of sugar in the mixture from organ **Q** after 20 minutes.

_____

Answer _____ mol per dm^3

(1)

(ii) Use your answer to (c)(i) to calculate the rate at which sugar was produced in the mixture containing amylase from organ **Q**.

Show clearly how you work out your answer.

_____

_____

_____

Answer _____ mol per dm^3 per minute

(2)

(iii) Suggest why the amount of light passing through the mixture from organ **P** did not change after 16 minutes.

_____

_____

_____

(1)

(iv) One of the students suggested that they could have completed their experiment more quickly if the temperature of the water-bath had been set at 80 °C.

This would **not** have been the case.

Explain why.

_____

_____

_____

_____

_____

(2)

(Total 10 marks)

A level - up to grade C

2 **(a)** Enzymes are biological catalysts.

Explain the term *biological catalyst*.

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..... **[2]**

(b) When the enzyme catalase is added to hydrogen peroxide, the following reaction occurs:

$$\underset{\text{hydrogen peroxide}}{H_2O_{2(l)}} \xrightarrow{\text{catalase}} 2\,H_2O_{(l)} + O_{2(g)}$$

In an investigation into the effect of temperature on the rate of this reaction, a student set up apparatus as shown in Fig. 2.1, using liquidised celery as a source of catalase.

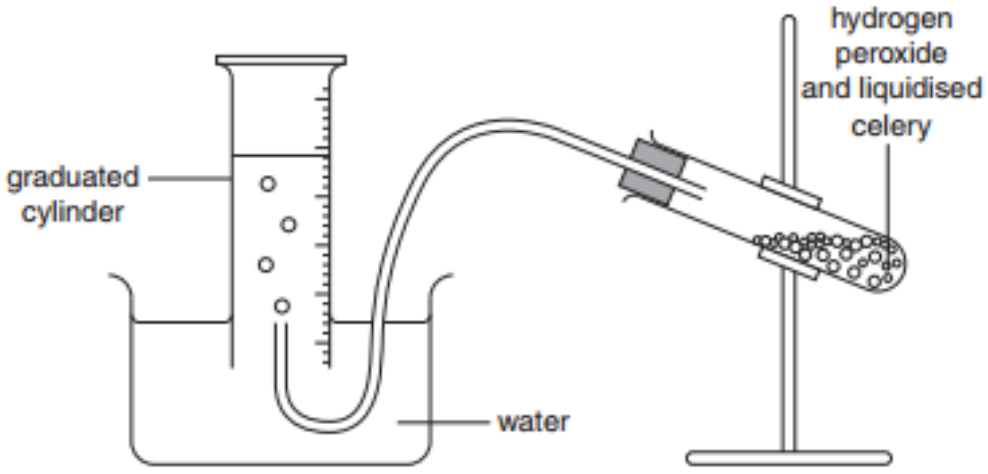

Fig. 2.1

The student measured the volume of oxygen produced at five different temperatures using samples of the liquidised celery.

(i) State the other variable that needs to be measured in order to calculate the **rate** of reaction.

..... **[1]**

(ii) Identify **one** potential problem with using samples of liquidised celery as a source of catalase in this investigation **and** suggest a way to minimise this problem.

.....

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..... **[2]**

(iii) The student collected the data shown in Table 2.1.

Table 2.1

temperature (°C)	volume of oxygen (cm^3)
5	4
10	7
12	10
25	28
28	32

Suggest how the student could check the reliability of the data.

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..... **[2]**

(c) Another student carried out a similar procedure and presented his results as a graph. The graph that he drew is shown in Fig. 2.2.

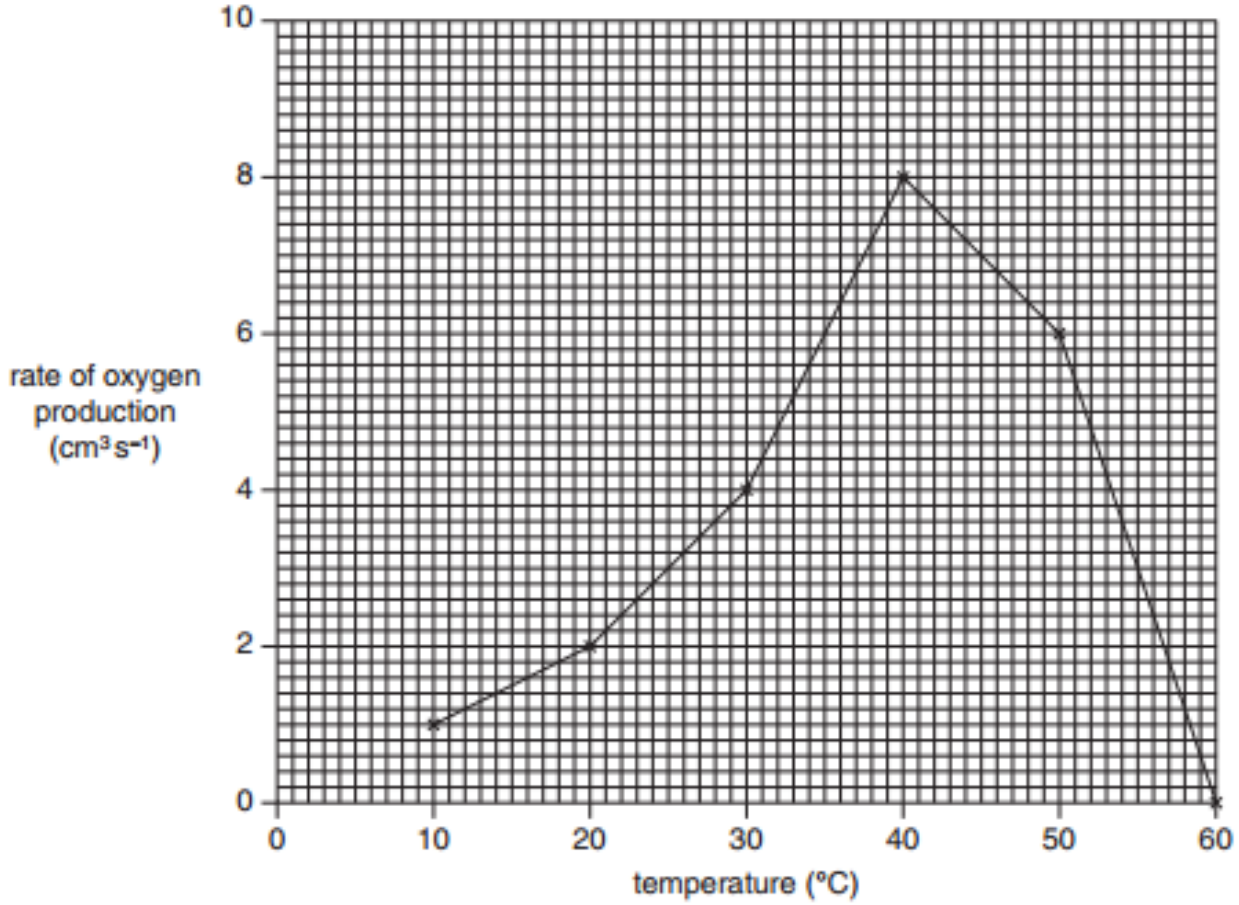

Fig. 2.2

(i) Describe the data shown in Fig. 2.2.

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..... **[4]**

(ii) Q_{10} is a measure of the increase in the rate of reaction for a 10 °C rise in temperature.

It is calculated using the following formula:

$$Q_{10} = \frac{\text{rate at } (t + 10\,°C)}{\text{rate at } t\,°C}$$

where t + 10 °C = rate at the higher temperature
t = rate at the lower temperature

Using the information in Fig. 2.2, calculate Q_{10} between 15 °C and 25 °C.

Show your working.

Answer = ... **[1]**

(iii) In the conclusion to this experiment, the student wrote the following:

> ***As the heat increased, the reaction went faster until it got to its highest. After this, the rate of reaction fell. This happened because the enzyme was killed and the hydrogen peroxide could not fit into the enzyme's key site.***

Suggest a more appropriate word to replace each of the underlined words.

heat should be replaced with .....

highest should be replaced with .....

killed should be replaced with .....

key should be replaced with ..... **[4]**

[Total: 16]

A level - up to grade A

1 Pepsin is an enzyme that digests protein foods in the mammalian stomach.

(a) Protein molecules are made from chains of amino acids.

(i) Name the covalent bond between two adjacent amino acids in a chain of amino acids.

..... [1]

(ii) Name the type of reaction involved in breaking this bond **and** describe what happens in this reaction.

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..... [2]

(b) Describe how an enzyme, such as pepsin, breaks down a substrate.

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..... [5]

(c) A student investigated how changing the pH affected the activity of pepsin.

- He used a blender to make a suspension of egg white (protein) in water.
- At the start of the investigation the suspension was cloudy.
- He prepared fixed concentrations of egg white suspension, acid and pepsin to add to each of six test-tubes.
- He removed 0.1 cm^3 of the mixture from each test-tube and used universal indicator to measure the pH of each mixture.
- He incubated each test-tube in a water bath at 35°C and timed how long it took for the egg white suspension in each tube to clear.
- He prepared a table in which he recorded his results (Table 1.1).

Tube	Volume of egg white suspension	Volume of acid added (cm^3)	Amount of pepsin added (cm^3)	Measured pH	Time for suspension to clear (m)
1	5	2.0	3.0	1	
2	5	1.5	3.0	2	
3	5	1.0	3.0	3	
4	5	0.5	3.0	4	
5	5	0.0	3.0	5	
6	5	2.0	0.0	1	

Table 1.1

(i) Identify **three** errors the student made in the preparation of his **table** before he recorded his results.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(ii) Identify a change the student could make to his procedure that would increase the **validity** of the investigation.

.....

..... [1]

(iii) State the term that best describes the purpose of **tube 6**.

..... [1]

(iv) Another student suggested that he should repeat the investigation at least twice.

How would this have improved the investigation?

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..... [2]

(d) Fig. 1.1 shows the effect of increasing the substrate concentration on the rate of activity of pepsin.

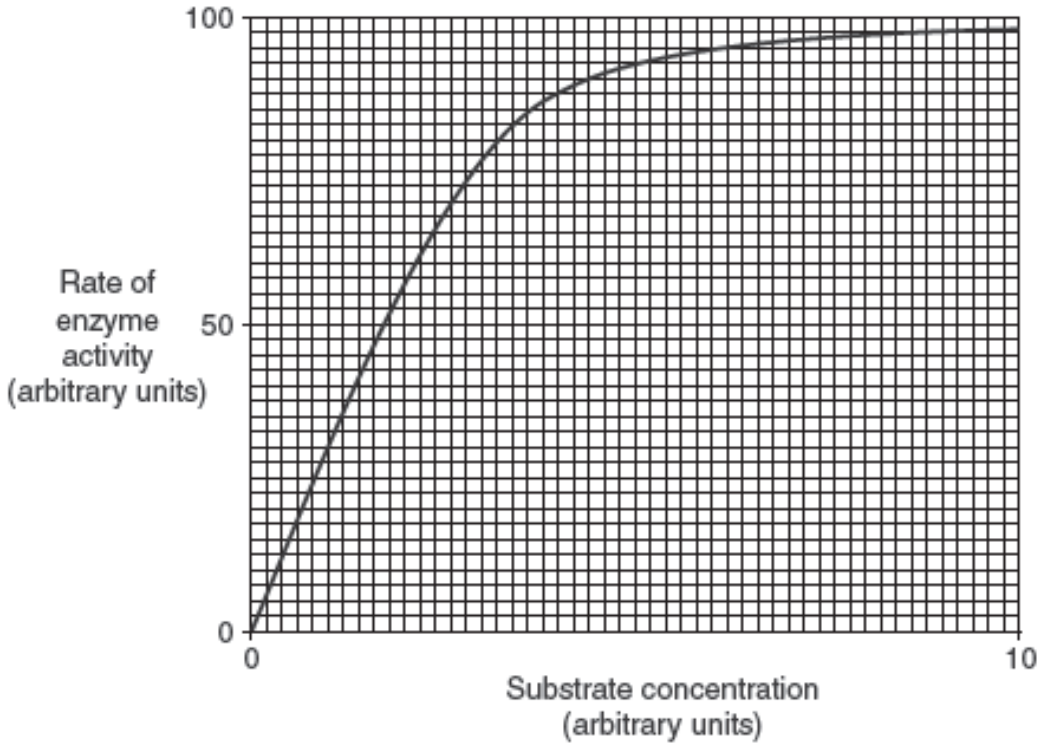

Fig. 1.1

(i) Pepstatin is a competitive inhibitor of pepsin.

On Fig. 1.1, draw a line to represent the effect of adding a fixed concentration of pepstatin on the rate of pepsin activity over the whole range of substrate concentrations.

..... *This should be answered on Fig. 1.1* .....**[2]**

(ii) Pepstatin acts as a competitive inhibitor of pepsin.

What can you conclude about the structure of pepstatin?

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..... **[2]**

[Total: 19]