1 Many reactions in living organisms are catalysed by enzymes.

Amylase is an extracellular enzyme that catalyses the breakdown of the polysaccharide starch (amylose) in the digestive system of many animals.

(a) Why is the enzyme amylase described as being extracellular?

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

(b) A student investigated the effect of changing the concentration of starch on the rate of starch breakdown by amylase.

The results of the investigation are shown in Fig. 2.1.

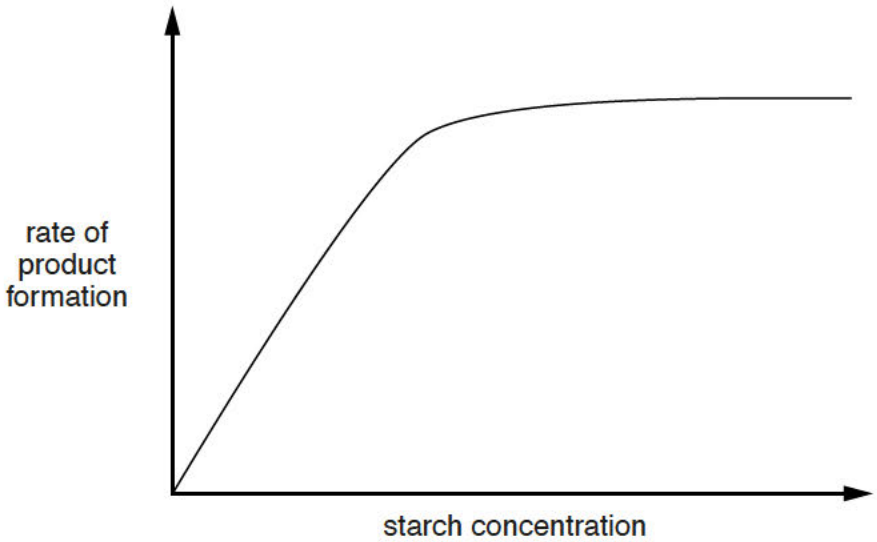


Fig. 2.1

(i) To calculate the rate of starch breakdown, the student measured the concentration of the breakdown **product**.

State the other variable the student needed to know in order to calculate the **rate** of this reaction.

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

(ii) **Explain** the shape of the graph shown in Fig. 2.1.

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..... **[5]**

(iii) The student kept the pH of the solution constant during the experiment.

Explain why it is important that the pH was kept constant.

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..... **[3]**

(iv) Suggest **two** other variables the student should have kept constant during the experiment.

1 .....

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2 .....

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[2]

(c) Cellulose is another polysaccharide that is present in some living organisms.

(i) Complete the following table to show **three** other differences in the **structures** of starch (amylose) and cellulose molecules.

Amylose	**Cellulose**
coiled	no coiling

[3]

(ii) Which properties of cellulose make it suitable for forming cell walls?

.....

.....

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

[Total: 17]

2 A breed of cattle, known as Chillingham cattle, is thought to resemble the wild cattle from which modern domestic breeds have been produced.

Fig. 7.1 shows one of the Chillingham cows and Fig. 7.2 shows a modern cow.



Fig. 7.1 Chillingham cow



Fig. 7.2 modern cow

(a) (i) Suggest **one** feature of the Chillingham cow that is likely to have changed during selective breeding to increase productivity.

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

(ii) Describe how modern cattle have been produced from less productive wild cattle ancestors.

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

(b) Many people in the UK consume large amounts of milk and beef.

Over-consumption of milk and beef can lead to an unbalanced diet and malnutrition.

(i) Define the term *balanced diet.*

.....

.....

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

(ii) Milk and beef both contain triglyceride molecules.

Fig. 7.3 represents a triglyceride molecule.

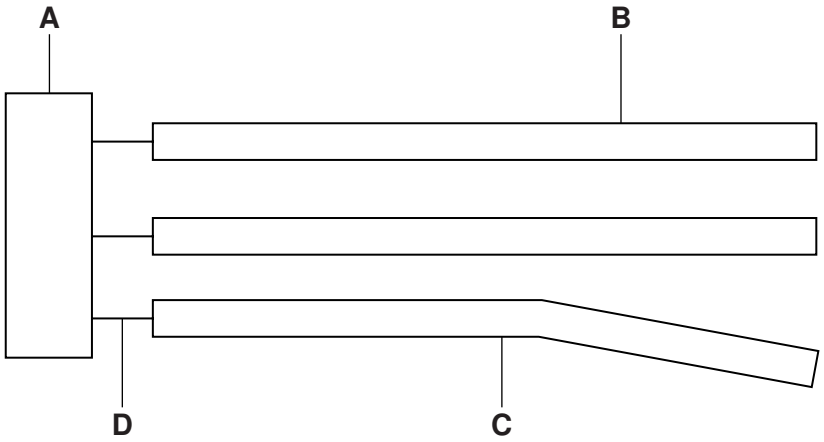


Fig. 7.3

Identify **A**, **C** and **D** on Fig. 7.3.

A .....

C .....

D .....

[3]

(iii) Suggest and explain why over-consumption of milk and beef can lead to malnutrition.

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..... **[3]**

(c) In the past, beef was preserved by adding salt.

Explain how salting preserves food.

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..... **[3]**

[Total: 16]

3 Fig. 2.1 shows part of an **amylose** molecule. This is an unbranched form of starch.

When iodine solution is added to starch, iodine fits into the helix of the amylose molecule, producing a colour change.

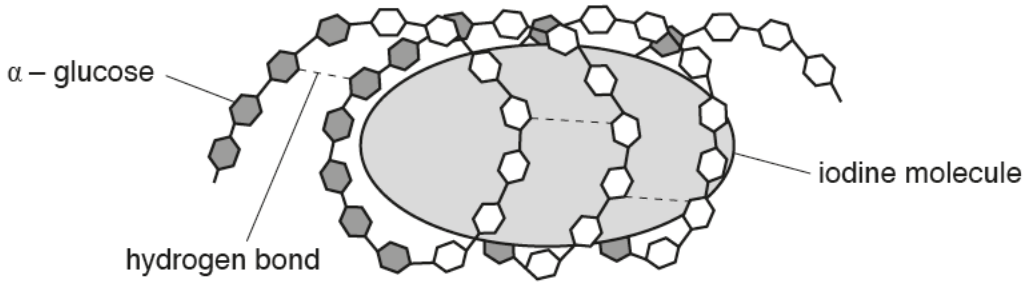


Fig. 2.1

(a) (i) State the colour of iodine solution in the presence of starch.

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

(ii) Hydrogen bonds hold the amylose molecule in its helical shape.

Describe how a hydrogen bond is formed.

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

(iii) Using the information in Fig. 2.1, suggest what would happen to the iodine-amylose complex if the solution was heated to 60 °C.

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

(b) **Amylase** is an enzyme that hydrolyses amylose to maltose. Maltose, like glucose, is a reducing sugar.

A student investigated the action of amylase on amylose. She mixed amylase with amylose and placed the mixture in a water bath.

Describe how she could measure the change in concentration of maltose (reducing sugar) as the reaction proceeds.



In your answer, you should ensure that the steps in the procedure are sequenced correctly.

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(c) Fig. 2.2 shows the results that the student obtained from a practical procedure in which the rate of formation of maltose was measured in the presence and absence of chloride ions.

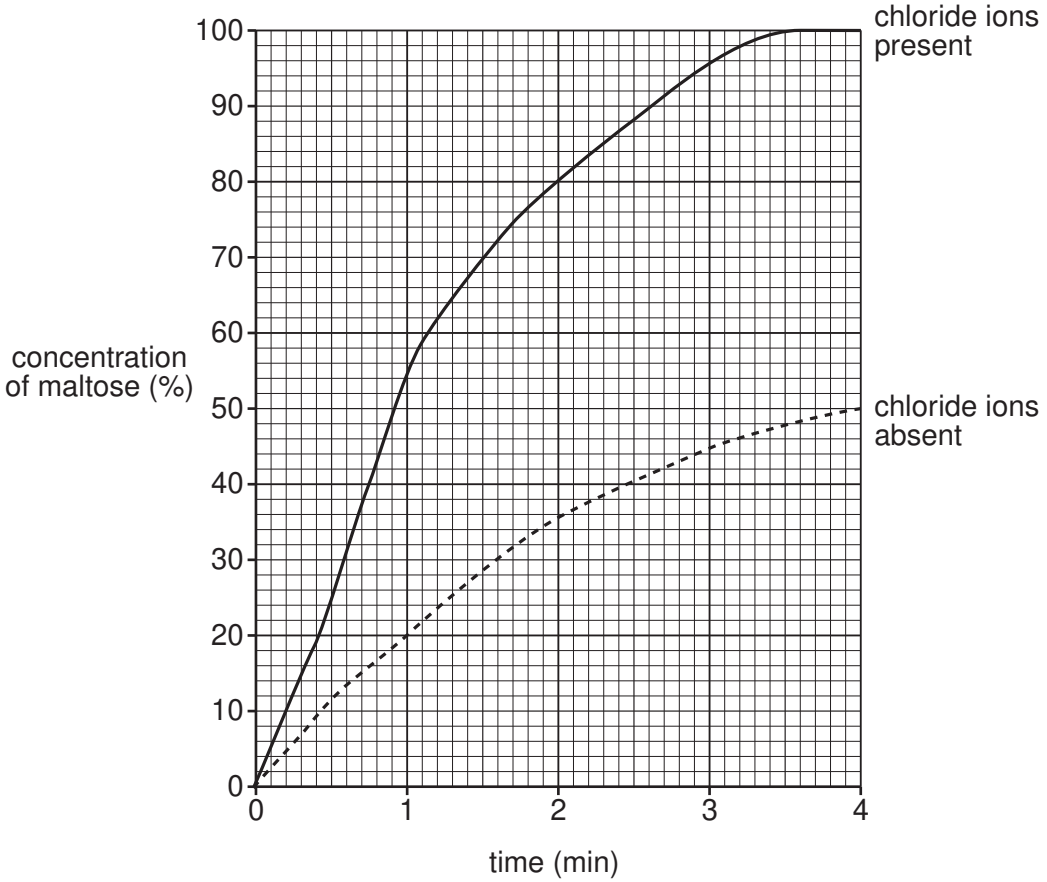


Fig. 2.2

(i) Describe the effect of chloride ions on the rate of reaction.

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

(ii) Suggest how chloride ions have this effect on the rate of reaction.

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

(iii) State **three** variables that need to be controlled in this practical procedure in order to produce valid results.

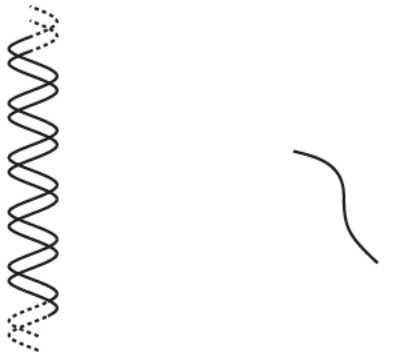
1 .....

2 .....

3 ..... **[3]**

[Total: 19]

4 **(a)** Fig. 4.1 is a drawing that represents molecules of DNA and messenger RNA (mRNA).



DNA **mRNA**

Fig. 4.1

The mRNA molecule is shorter than the DNA molecule.

(i) State, using **only** the information in Fig. 4.1, **one other** way to distinguish between DNA and mRNA.

.....

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

(ii) Give **one** further difference in **structure** between DNA and RNA.

.....

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

DNA and mRNA are both involved in protein synthesis. The mRNA molecule, carrying the code for protein, leaves the nucleus and attaches to a ribosome. The ribosome is the site where a protein molecule is formed.

(iii) Complete the following statement:

A sequence of DNA nucleotides that codes for a protein is a ..... **[1]**

(iv) Suggest why DNA is not able to leave the nucleus.

.....

.....

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

(v) Explain why the mRNA molecule is shorter than a DNA molecule.

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

(b) Enzymes are involved in the production of mRNA in eukaryotic cells. One enzyme is inhibited by the toxin, α-amanitin.

Fig. 4.2 shows the effect when α-amanitin attaches to this enzyme.

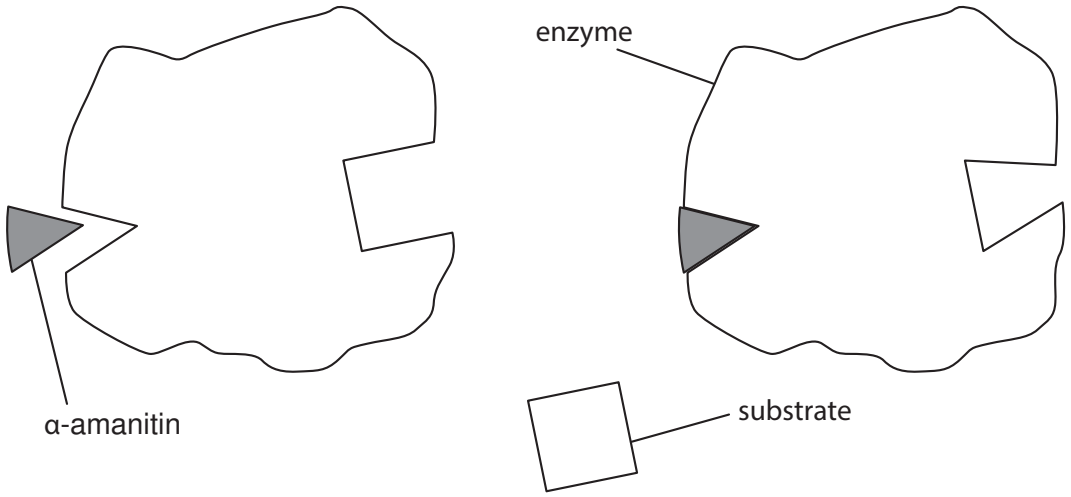


Fig. 4.2

(i) Explain how α-amanitin stops the formation of an enzyme-substrate complex during RNA production.

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

(ii) The Roman Emperor Claudius was poisoned by his wife Agrippina when she gave him death cap fungus to eat. The death cap fungus contains α-amanitin.

Suggest how the toxin α-amanitin may lead to the death of an organism.

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

(c) (i) Enzymes are globular proteins with a specific three dimensional shape. The shape is determined by the primary structure.

State the meaning of the term *primary structure*.

.....

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

Fig. 4.3 shows some of the chemical bonds that hold the **tertiary** structure of a protein together.

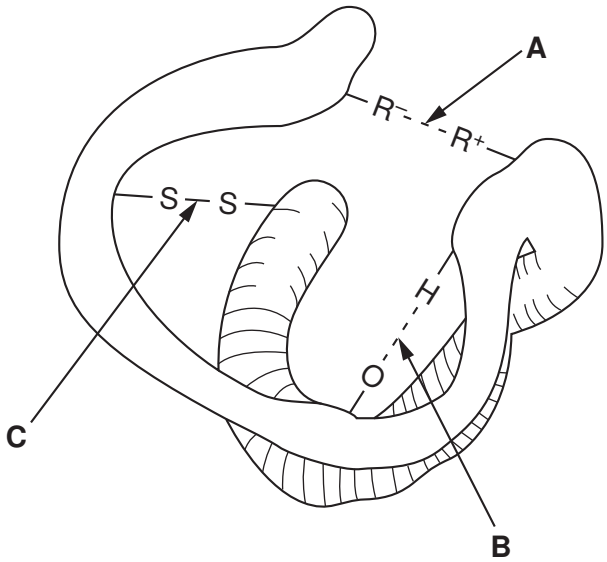


Fig. 4.3

(ii) Name the bonds labelled **A**, **B** and **C**.

A.....

B.....

C .....

[3]

(d) When proteins are heated to a high temperature, their tertiary structure is disrupted.

Explain how this occurs.

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..... **[3]**

[Total: 17]