

Name of the Student: _____

Max. Marks : 23 Marks

Time : 23 Minutes

Q1.

Oxygen is transported round the body by the blood.

Blood leaving the human lung can carry about 250 milligrams of oxygen per litre.
However, only 7 milligrams of oxygen will dissolve in one litre of water at body temperature.

- (a) Suggest an explanation for the difference.

(2)

- (b) Blood leaving the skeletal muscles during exercise may contain only 30 milligrams of oxygen per litre.

Explain what causes the difference in oxygen concentration between the blood leaving the lungs and the blood leaving the skeletal muscles.

(4)

(Total 6 marks)

Q2.

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

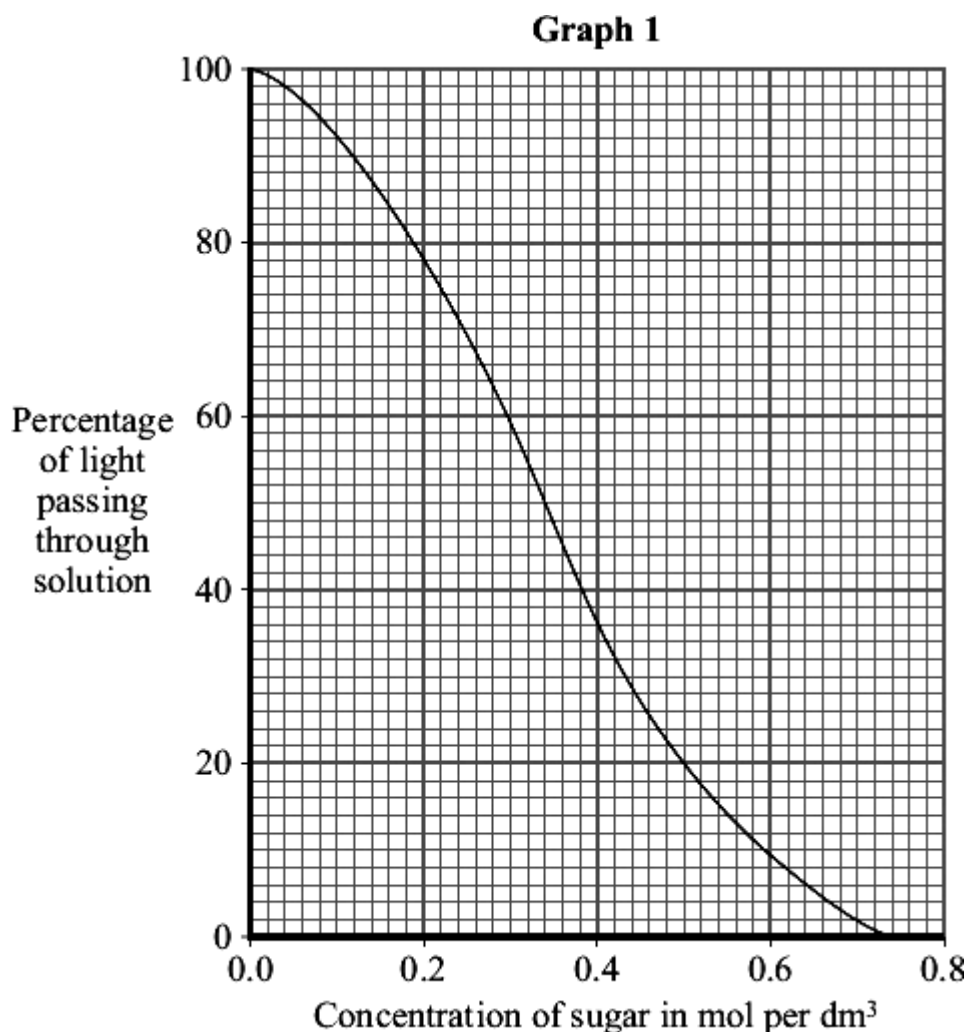
- (a) Name **two** other organs in the digestive system which produce amylase.

_____ 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 cm³ samples of amylase from **P** and **Q** and placed them into a water-bath at 40 °C.
- Two test tubes containing 10 cm³ 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.

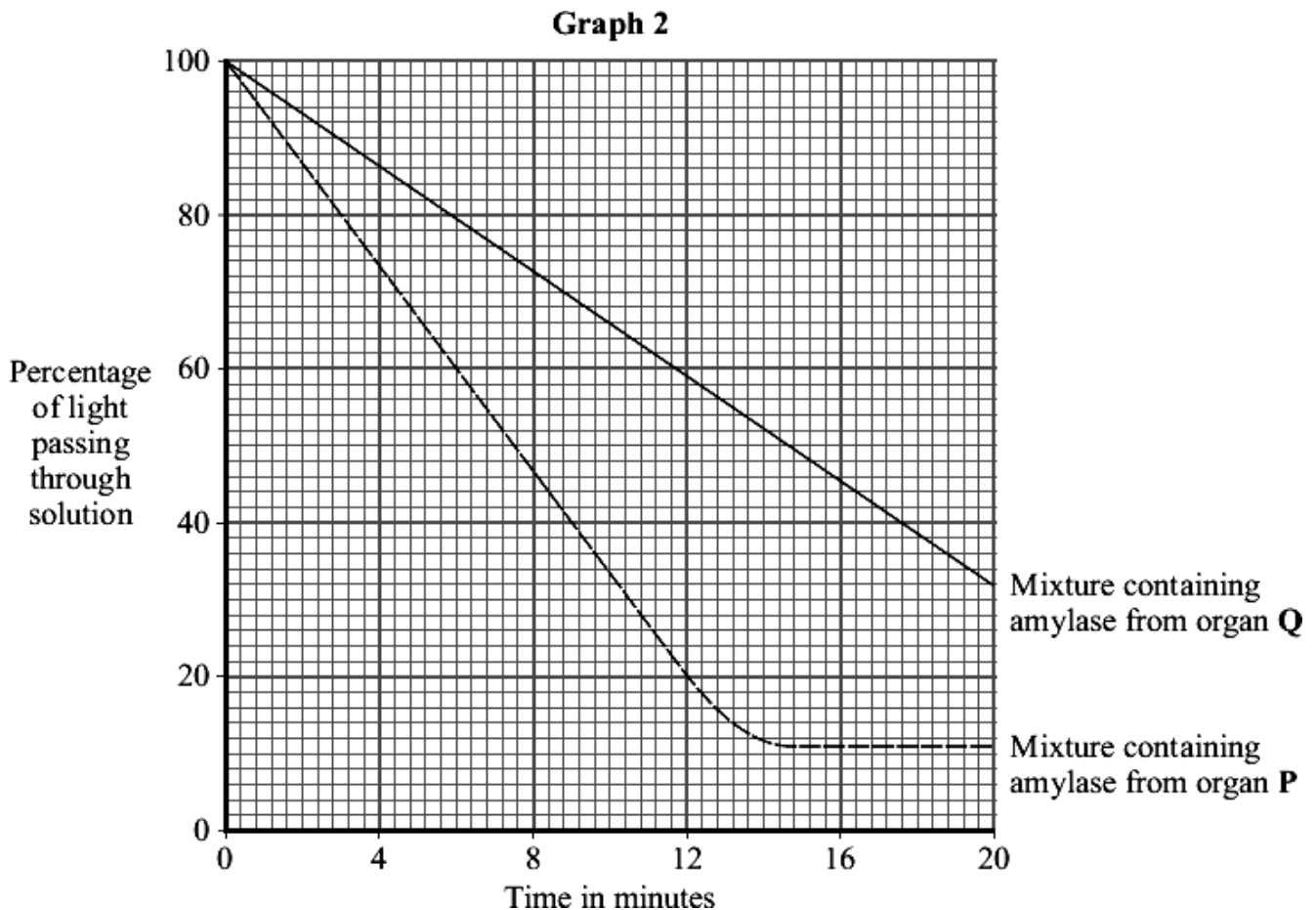
- Every minute, a few drops were taken from each tube, the test reagent was added and the percentage of light passing through this solution was measured in the colorimeter.

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 dm³

(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 dm³ 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)

Q3.

Fresh milk is a mixture of compounds including fat, protein and about 5 % lactose sugar. Lactose must be digested by the enzyme lactase, before the products can be absorbed.

Lactase can be added to fresh milk to pre-digest the lactose. This makes 'lactose-free' milk, which is suitable for people who do not produce enough lactase of their own.

A student investigated the effect of changing pH and temperature on the digestion of lactose in milk.

The results are shown in **Tables 1** and **2**.

Table 1
Effect of pH

pH	Time taken to digest lactose in minutes
4.0	20
5.0	18
6.0	13
7.0	7
8.0	5
9.0	6

Table 2
Effect of temperature

Temperature in °C	Time taken to digest lactose in minutes
30	20
35	14
40	11
45	6
50	12
55	23

- (a) The label on a carton of lactose-free milk states:

'Lactase is normally produced in the stomach of mammals.'

The results in **Table 1** show that this statement is unlikely to be true.

Explain how.

(2)

- (b) Explain as fully as you can the results shown in **Table 2**.

(3)

- (c) Bile is produced in the liver and is released into the small intestine.

Explain how bile helps the digestion of milk.

(2)

(Total 7 marks)