المدرسة
الوطنية الأرثوذكسية
الشميساني

The National
Orthodox School
Shmaisani

Stage (9 - 12)
1st Semester | 2023-2024

**Subject:** Biology **Mark scheme**
**10 IB**

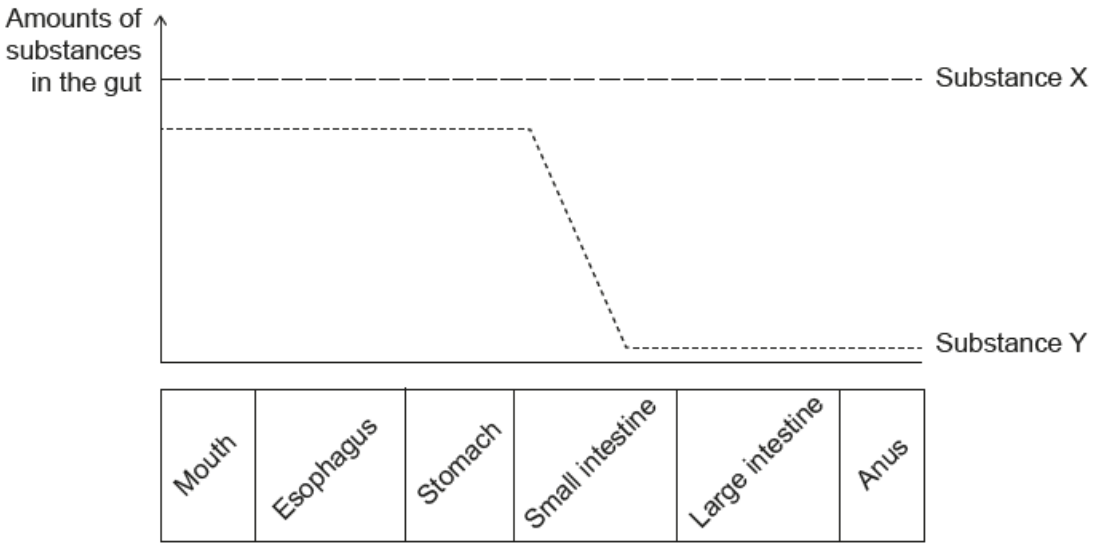
Name : ……

# 3.1 The Digestive system

## *Practice paper*

## Question 1 : Circle the correct answer :

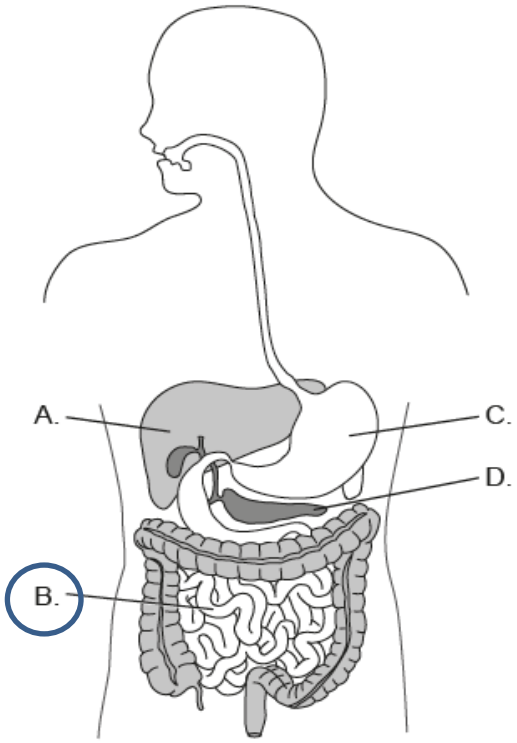
1.The graph shows the amounts of two substances present in food ingested by a healthy person as it moves along the gut.



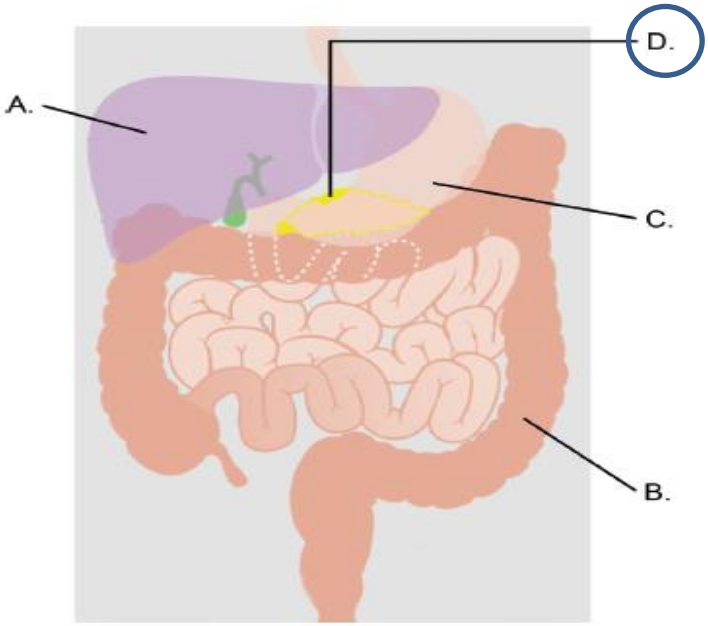

Which substances could X and Y be?

| | Substance X | Substance Y |
|---|---|---|
| A. | amylose | glucose |
| B. | glucose | cellulose |
| C. | water | amylose |
| D. | cellulose | vitamin C |

2.Where in the digestive system are lipids broken down?




3.The diagram shows some of the organs associated with the digestion of starch. Which organ produces amylase?



4.A fluid sample is taken from the digestive tract of a mammal. The sample is basic (alkaline) and able to digest starch and proteins. From which part of the digestive tract was the fluid taken?

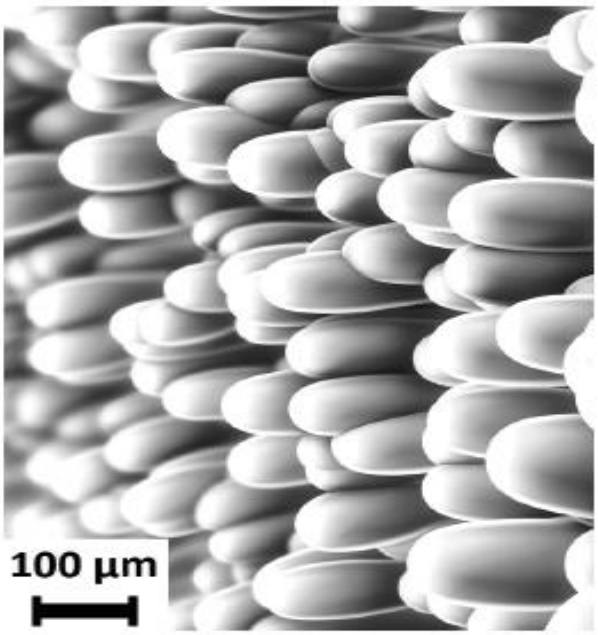
A. Mouth

B. Stomach

C. Small intestine

D. Gall bladder

5.What are these structures?




A. Fatty acids in the small intestine

B. Bacteria in the large intestine

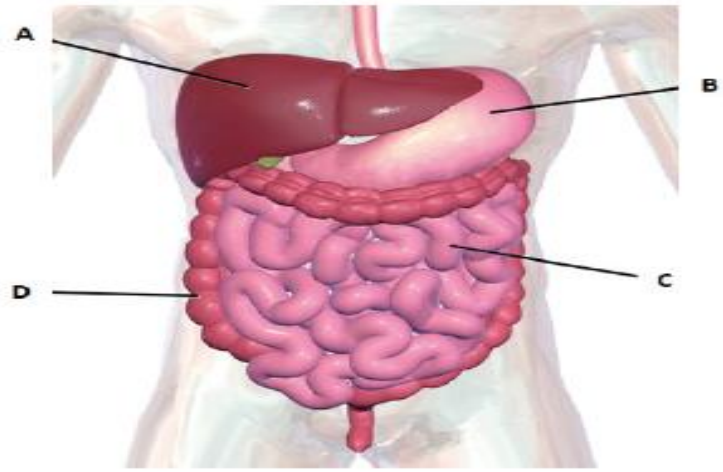
C. Villi in the small intestine

D. Feces egested from the large intestine

6.Which products are formed by the action of the enzymes protease and amylase?

| | Protease | Amylase |
|---|---|---|
| A. | fatty acids | glucose |
| B. | glycerol | fatty acids |
| C. | proteins | starch |
| D. | amino acids | maltose |

7.The diagram shows the human digestive system. Which organ is responsible for the majority of the absorption of digested food?




8. What is an example of assimilation?

A absorption of glycerol into lacteals

B breakdown of alcohol in the liver

C building of proteins from amino acids

D release of a hormone from a gland

9. Which digestive processes take place in the mouth (buccal) cavity?

| | chemical digestion | mechanical digestion | dissolving of nutrients |
|---|---|---|---|
| A | ✓ | ✓ | ✓ |
| B | ✓ | ✓ | ✗ |
| C | ✓ | ✗ | ✓ |
| D | ✗ | ✓ | ✓ |

10. Four test tubes, each containing 2cm$^3$ of amylase solution are treated as follows:

1 boiled, then cooled to 1 °C

2 boiled, then cooled to 25 °C

3 frozen, then warmed to 1 °C

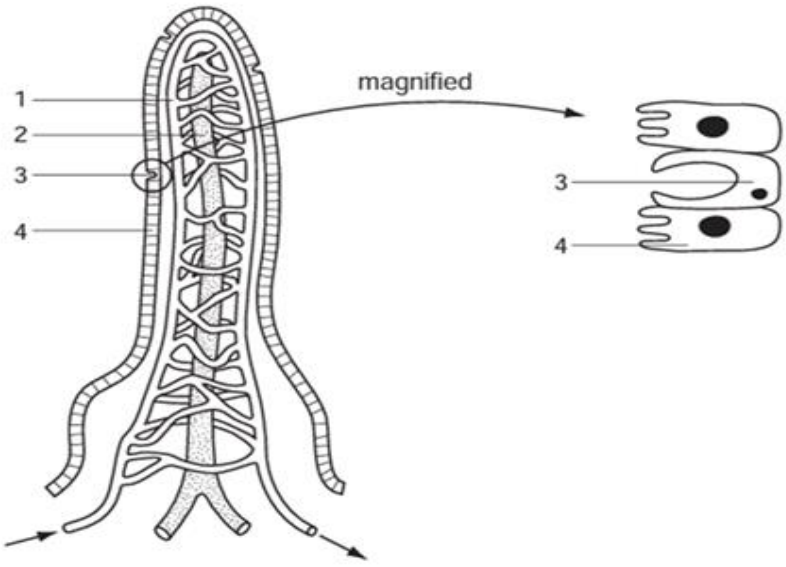
4 frozen, then warmed to 25 °C

10 cm$^3$ of starch solution were then added to each tube and after 5 minutes, 2 drops of iodine solution were added to each tube.

Which row shows the results?

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| **A** | black | black | black | yellow |
| **B** | black | yellow | black | yellow |
| **C** | yellow | black | yellow | black |
| **D** | yellow | yellow | yellow | black |

11. The diagram shows a section through a villus.




Which sequence correctly describes the functions of the numbered parts?

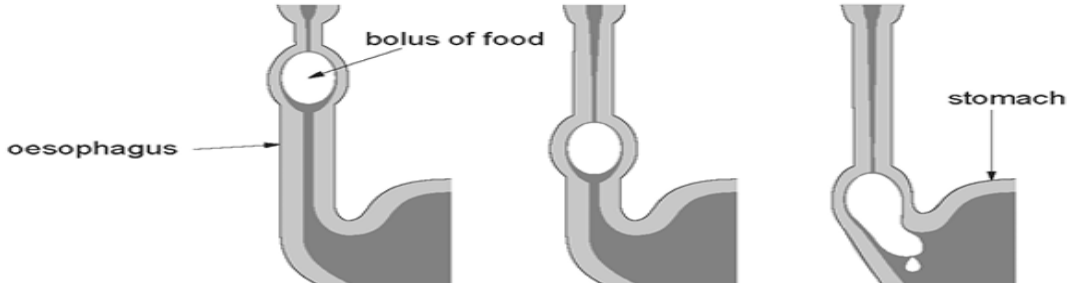
| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| **A** | transports digested fats | transports glucose | absorbs digested food | produces mucus |
| **B** | transports digested fats | transports glucose | produces mucus | absorbs digested food |
| **C** | transports glucose | transports digested fats | absorbs digested food | produces mucus |
| **D** | transports glucose | transports digested fats | produces mucus | absorbs digested food |

12. Which of the following descriptions are correctly matched to the different stages of food breakdown?

| | absorption | assimilation | egestion |
|---|---|---|---|
| A | small soluble food molecules move into the bloodstream | small soluble food molecules cross the cell membrane of cells | excretion of undigested or unabsorbed food through the anus |
| B | small soluble food molecules move into the bloodstream | small soluble food molecules cross the cell membrane of cells | passing out of undigested or unabsorbed food through the anus |
| C | small soluble food molecules cross the cell membrane of cells | small soluble food molecules move into the bloodstream | passing out of undigested or unabsorbed food through the anus |
| D | small soluble food molecules cross the cell membrane of cells | small soluble food molecules move into the bloodstream | excretion of undigested or unabsorbed food through the anus |

## Question 2 :

The diagram shows a process occurring in the human digestive system.




(i) Name the process shown in the diagram. [1]

peristalsis

(ii) Explain how the bolus of food is moved along the oesophagus. [2]

By the action of contraction and relaxation of the circular and longitudinal muscles in the wall of the esophagus (antagonistic muscle pair )

## Question 3:

During digestion, enzymes act on different types of food to produce simpler substances that can be absorbed.

Complete Table 1 by inserting the missing information.

**Table 1**

| food type | enzyme acting on the food type | simpler substances produced |
|---|---|---|
| Protein | Protease | short polypeptides and amino acids |
| starch | Amylase | maltose |
| fat | lipase | Fatty acids and glycerol |

## Question 4 :

The teeth are responsible for the physical digestion of food molecules when we chew.

(i) Define the term 'physical digestion'.

The breakdown of food into smaller pieces WITHOUT chemical change to food molecules

**Large pieces → Smaller Pieces**

[2]

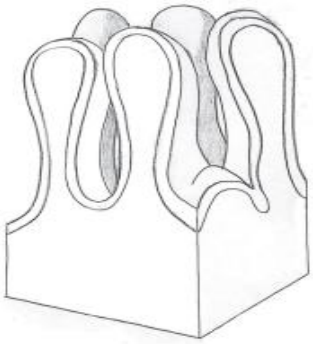
(ii) Describe the purpose of physical digestion.

[1]

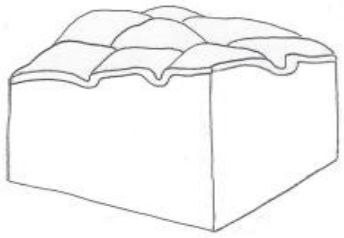
This process is done by the **teeth** in the mouth where food is broken down into smaller pieces so as to have a **larger surface area** and to be mixed with saliva and exposed to enzymes.

## Question 5 :

Celiac disease is an immune reaction to eating gluten, a protein found in many cereals. The diagram shows the arrangement of normal villi and villi affected by celiac disease in the small intestine.



Normal villi



Villi affected by celiac disease

(a) Outline the functions of the villi in the small intestine.

a. increase the surface area for absorption ✔

b. absorption of digested foods/nutrients ✔

c. absorption of mineral ions/vitamins ✔

(b) Explain the consequences of celiac disease for absorption of digested nutrients.

a. (celiac disease/gluten causes) much smaller villi/flattened villi/smaller surface area (of villi) / no villi ✔

b. (smaller villi leads to) less efficient/less/slower/poor absorption
OR
nutrients/energy lost / fatigue/malnutrition may result ✔

Note that this question requires an explain not an outline.

(c) Wheat, barley and rye all contain gluten. Outline how a protein such as gluten is digested.

a. enzymes/protease required ✔

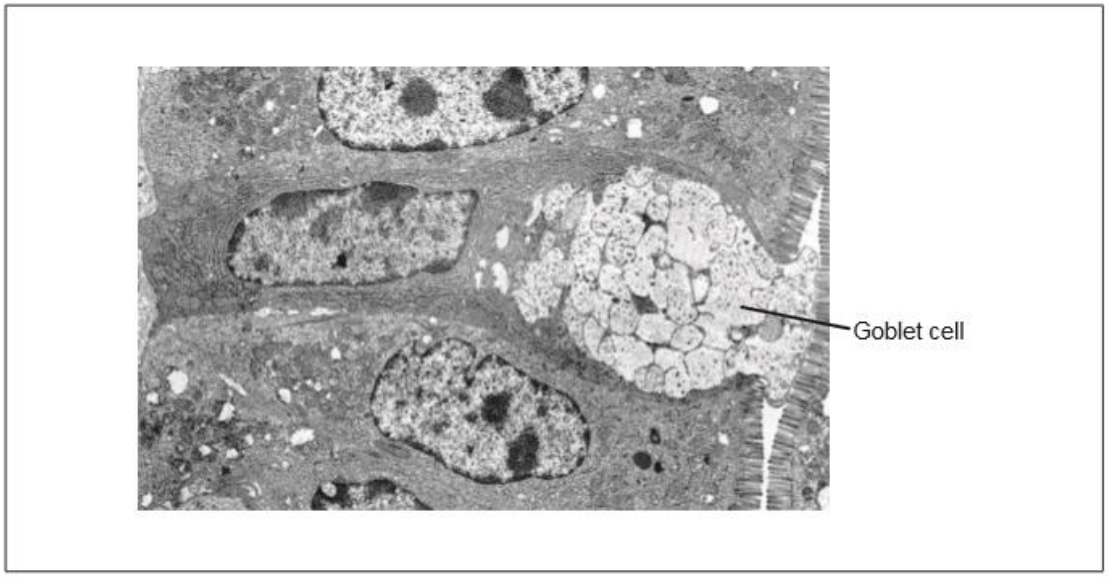
b. (protease/peptidase) breaks peptide bonds/bonds between amino acids ✔

c. hydrolysis adds water molecules/breaks peptide bonds between amino acids ✔

d. protein/macromolecule converted to monomer/amino acids ✔

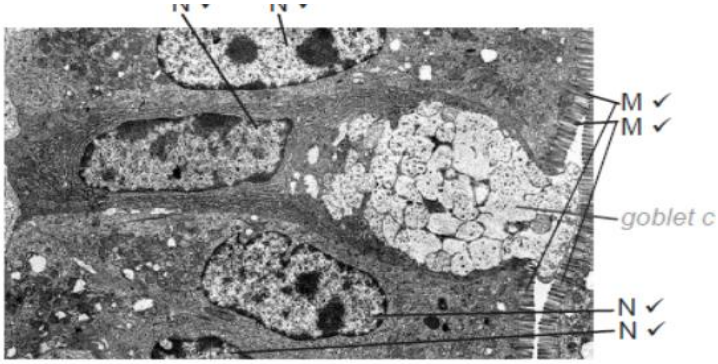
## Question 6 :

a. The image is an electron micrograph of the lining of the small intestine.




(i) Label the microvilli using the letter M and a nucleus using the letter N.

(ii) State the function of the goblet cell . produce mucus



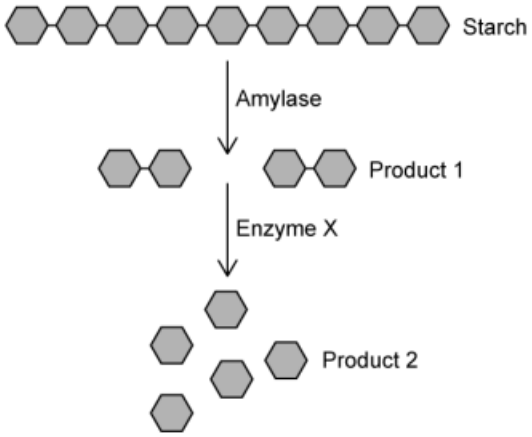

*Award [1] for one microvillus labelled M and one nucleus labelled N.*

*Both are essential for the mark.*

*Do not award the mark if any structure is labelled incorrectly.*

## Question 7 :

The following diagram illustrates the steps involved in the digestion of starch.




a. State the name of product 1 ……maltose ……

b. Enzyme X is responsible for completing the digestion of starch. State the name of enzyme X. ……maltase ……..

c. Product 2 represents the final product of starch digestion. Identify product 2 ……glucose ……..

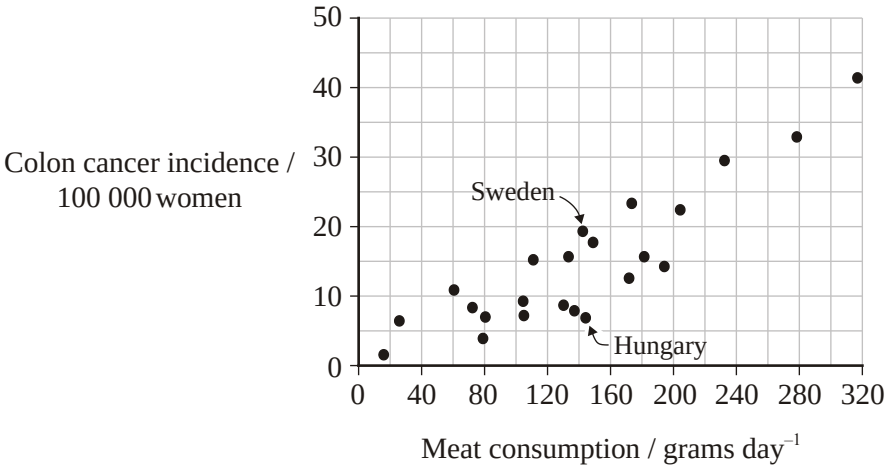
d. Outline the roles of pancreatic juice. Include the names of relevant enzymes in your answer

- Contains:
  - **NaHCO3**
  - protease called **trypsin**
  - carbohydrase **Amylase**
  - **lipase** enzyme
- **Lipase** starts to digest fats into **fatty acids and glycerol (partially)**
- **Trypsin** continues to break large proteins into **short polypeptide chains**

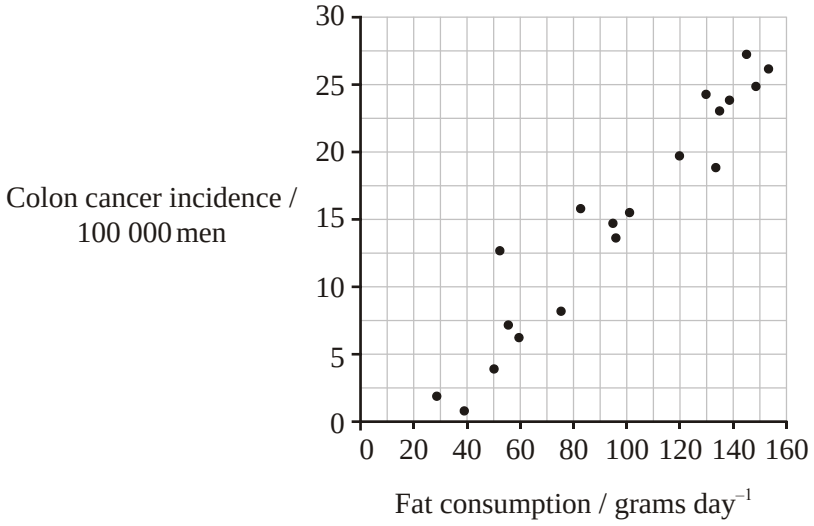
❖ **Amylase** breaks down the **polysaccharides** that were not broken down in the mouth into **maltose**

## Question 8:

Dietary factors are known to influence the incidence of colon cancer. The graphs below show the correlation between meat consumption (eating meat) and colon cancer in sample countries and the correlation between fat consumption and colon cancer.




[Source: B Armstrong and R Doll, Environmental factors and cancer incidence and mortality in different countries, with special reference to dietary practices, (1975), International J Cancer, **15**, pp 617–631]




[Source: http:members.aol.com/wantnomeat/page]

(a) (i) State the relationship between daily meat consumption and

the incidence of colon cancer in women.

positive correlation / higher incidence with higher meat consumption

(ii) Using the data in the two graphs opposite, suggest reasons for the relationship between daily meat consumption and the incidence of colon cancer in women.

**(2)**

fat consumption is correlated with / causes colon cancer;
meat contains (high levels of) fat; 2

(ii) Discuss whether meat consumption causes colon cancer in Sweden and Hungary.

same meat consumption but higher colon cancer rate in Sweden;
other factors cause colon cancer (in Sweden) / *eg* genetic factors,
lack of fibre;
only some types of meat may cause colon cancer;
meat may contain more fat in Sweden / other chemical differences;

other foods may protect against cancer (in Hungary);

## Question 9 :

A student investigated the activity of the digestive enzyme pepsin.

Fig. 6.1 shows the apparatus used in the investigation.

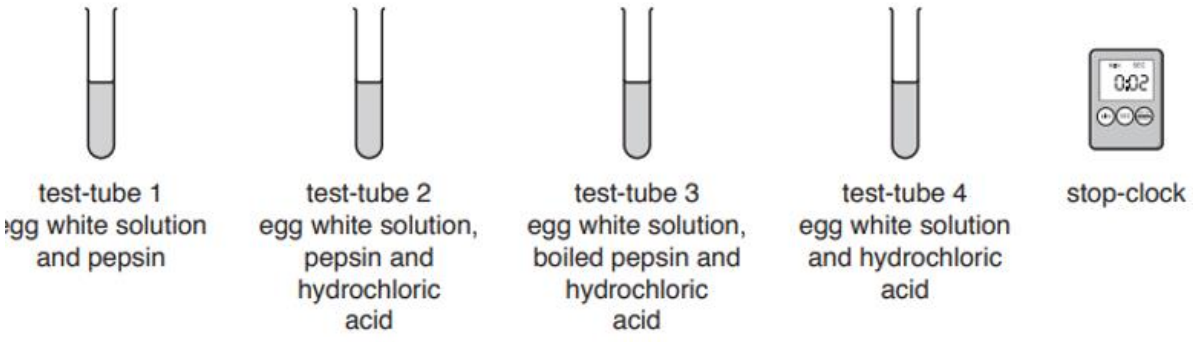



**Fig. 6.1**

The appearance of the four test-tubes was recorded at 0 and 5 minutes.

The protein in the egg white solution gives the solution a cloudy appearance.

The cloudy appearance clears when the protein in the egg white solution breaks down.

Table 6.1 shows the results.

**Table 6.1**

| test-tube | contents | appearance at 0 mins | appearance after 5 mins |
|---|---|---|---|
| **1** | egg white solution, pepsin | cloudy | less cloudy |
| **2** | egg white solution, pepsin, hydrochloric acid | cloudy | clear |
| **3** | egg white solution, boiled pepsin, hydrochloric acid | cloudy | cloudy |
| **4** | egg white solution, hydrochloric acid | cloudy | cloudy |

**(i)** Explain the results shown for test-tubes **1**, **2** and **3** in Table 6.1.

*test-tube 1*
**1** (less cloudy), slower break down of egg white solution / protein ;
**2** (no HCl so) pH of the solution is too high ; **ora**
**3** high pH denatures pepsin / enzyme ;

*test-tube 2*
**4** hydrochloric acid causes a low pH ;
**5** pepsin works best in / optimal activity, low pH / acidic conditions ;

*test-tube 3*
**6** pepsin / enzyme, unable to break down, protein / egg white solution ;
**7** boiling denatures, pepsin / enzyme ;

(ii) State the name of the organ in the body that produces pepsin.

**Stomach**

b. Maltase is another digestive enzyme.

Describe the action of maltase **and** state where it acts in the alimentary canal.

maltose broken down ;
to glucose ;
on the membranes of the epithelial lining ;
(acts) in the small intestine / duodenum ;