Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Human nutrition

Time allowed: 1 hour 50 minutes

Subject code **0610**

Biology

Questions from Paper 3 and Paper 4

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.

Total marks

/ 114

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.

Information

- This paper has 10 questions worth 114 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1 Fig. 2.1 is a diagram of part of the human digestive system.

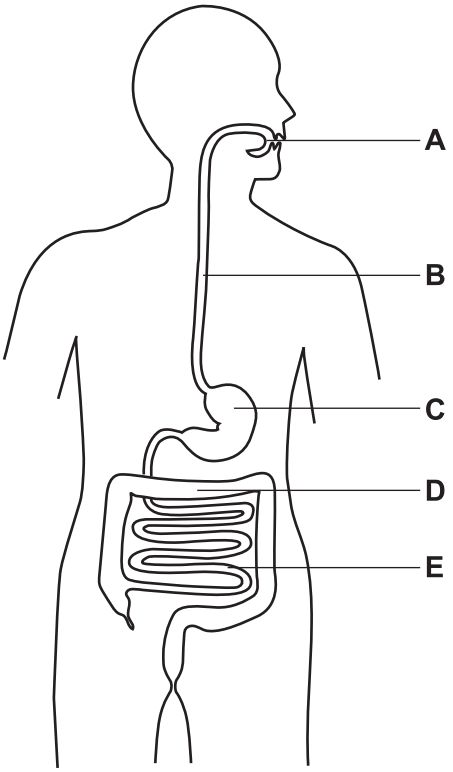


Fig. 2.1

(a) Using the information in Fig. 2.1, state the letters where:

chemical digestion of proteins begins .....

hydrochloric acid is produced .....

physical digestion of food occurs. ..... and .....

[4]

(b) State the names of **three** parts of the large intestine.

1 .....

2 .....

3 .....

[3]

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(c) Many processes occur in the digestive system.

The boxes on the left show some of the processes.

The boxes on the right show descriptions of some processes.

Draw **one** line to link each process to its description.

Draw **four** lines.

process	description
	breakdown of food
absorption	
	movement of nutrients from the intestines into the blood
digestion	
	removal of undigested food from the body as faeces
egestion	
	taking substances into the body
ingestion	
	uptake and use of nutrients by cells

[4]

[Total: 11]

Digestive system, teeth and digestion Click for more variations

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2 **(a)** State the meaning of the term chemical digestion.

.....

.....

.....

.....

..... [2]

(b) Enzymes are involved in chemical digestion.

Table 3.1 shows some information about enzymes used for chemical digestion.

(i) Complete Table 3.1.

Table 3.1

enzyme	substrate	products
amylase		simple reducing sugars
lipase	fats and oils	
protease	proteins	

[4]

(ii) State where amylase, lipase and protease are made in the human body.

amylase .....

lipase .....

protease .....

[3]

(c) **(i)** State the name of the acid found in gastric juice.

..... [1]

(ii) State **two** functions of the acid found in gastric juice.

1 .....

2 .....

[2]

[Total: 12]

Digestive system, teeth and digestion Click for more variations

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3 **(a)** A balanced diet includes foods that contain calcium ions.

(i) Circle the food that has the highest calcium content.

cheese **egg** **orange** **potato**

[1]

(ii) Table 4.1 shows the recommended calcium intake for different age groups.

Table 4.1

age group in years	recommended calcium intake / mg per day
0–3	500
4–8	800
9–18	1300
19–50	1000
51+	1200

The list shows five statements about the data in Table 4.1.

Tick (✓) **two** statements that are correct descriptions of the data shown in Table 4.1.

Age group 51+ has the highest recommended daily intake of calcium.	
As age increases, the recommended daily intake of calcium decreases.	
As age increases, the recommended daily intake of calcium increases, then decreases and then increases again.	
The recommended daily intake of calcium doubles from ages 0–3 to ages 19–50.	
The recommended daily intake of calcium is higher at ages 19–50 than at ages 9–18.	

[2]

(iii) Suggest reasons why some age groups need more calcium in their diet than others.

.....

.....

.....

.....

..... [2]

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(b) Some diseases are caused by an unbalanced diet.

The boxes on the left contain the names of two diseases.

The boxes on the right contain some sentence endings.

Draw **one** straight line from each box on the left to a box on the right to make **two** correct sentences.

	is caused by a lack of carbohydrate.
Rickets	
	is caused by a lack of iron.
	is caused by a lack of vitamin C.
Scurvy	
	is caused by a lack of vitamin D.

[2]

(c) **(i)** State **one** dietary source of fibre.

..... [1]

(ii) Describe the importance of fibre in the diet.

.....

.....

..... [1]

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(d) Fig. 4.1 is a diagram of part of the digestive system.

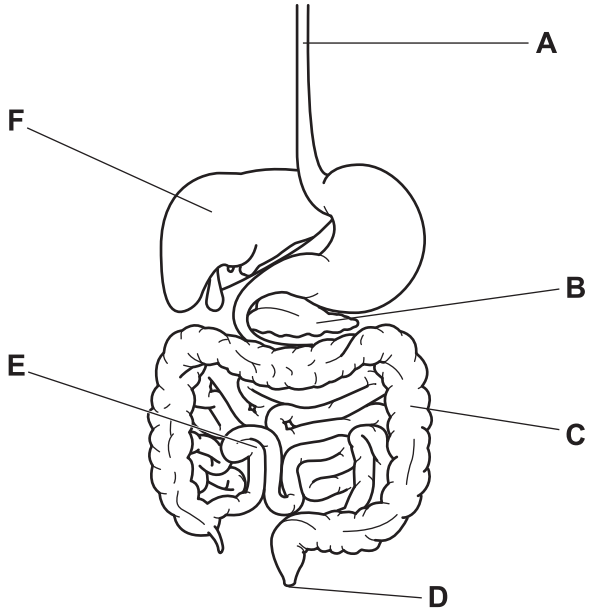


Fig. 4.1

(i) State **one** letter, from Fig. 4.1, that labels the part of the digestive system where egestion occurs.

..... [1]

(ii) State the **two** letters from Fig. 4.1 that label the parts of the digestive system where water is absorbed.

..... and ..... [2]

[Total: 12]

Diet Click for more variations

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4 **(a)** The boxes on the left show the types of digestion.

The boxes on the right contain sentence endings.

Draw lines to make **four** correct sentences.

type of digestion	sentence ending
	breaks down food into smaller pieces.
Chemical digestion	breaks down food molecules.
	involves chemical changes.
Physical digestion	involves enzymes.

[4]

(b) Ingestion occurs in the mouth.

State the name of the part of the alimentary canal where egestion occurs.

..... [1]

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(c) Fig. 7.1 shows a section through a human tooth.

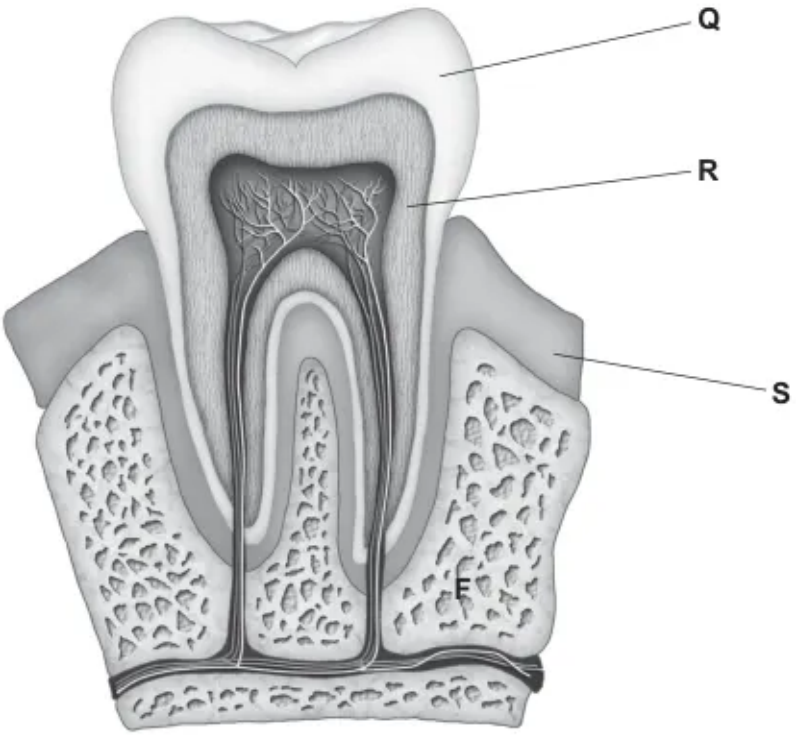


Fig. 7.1

(i) State the names of structures **Q**, **R** and **S** in Fig. 7.1.

Q .....

R .....

S .....

[3]

(ii) State the names of **two** structures found inside the pulp.

1 .....

2 .....

[2]

(iii) Identify the type of tooth shown in Fig. 7.1.

Explain how you made your choice.

type .....

explanation .....

.....

.....

[2]

[Total: 12]

Digestive system, teeth and digestion Click for more variations

5 Complete the sentences about enzymes by writing a suitable word or phrase in each of the spaces provided.

Enzymes are involved in chemical digestion which produces small ..... molecules that can be absorbed into the blood.

Two examples of protease enzymes are pepsin and trypsin. Pepsin is produced by the ..... and requires acidic conditions. These conditions are created by the release of ..... , which provides the optimum pH for pepsin activity and also kills harmful ..... .

The ..... produces trypsin which breaks down protein in ..... pH conditions. These conditions are created by a substance called ..... , which neutralises the gastric juices and also has an important role in the ..... of fats and oils.

[8]

Digestive system, teeth and digestion Click for more variations

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6 Digestive enzymes catalyse the breakdown of large insoluble molecules.

(a) (i) Explain why it is important that large insoluble molecules are broken down by chemical digestion.

.....

.....

.....

.....

..... [2]

(ii) State the name of the substance that is the solvent for most molecules that have been digested by enzymes.

..... [1]

(b) The activity of two protease enzymes, **A** and **B**, was measured at different pHs. Both enzymes are found in the human alimentary canal.

The results are shown in Fig. 2.1.

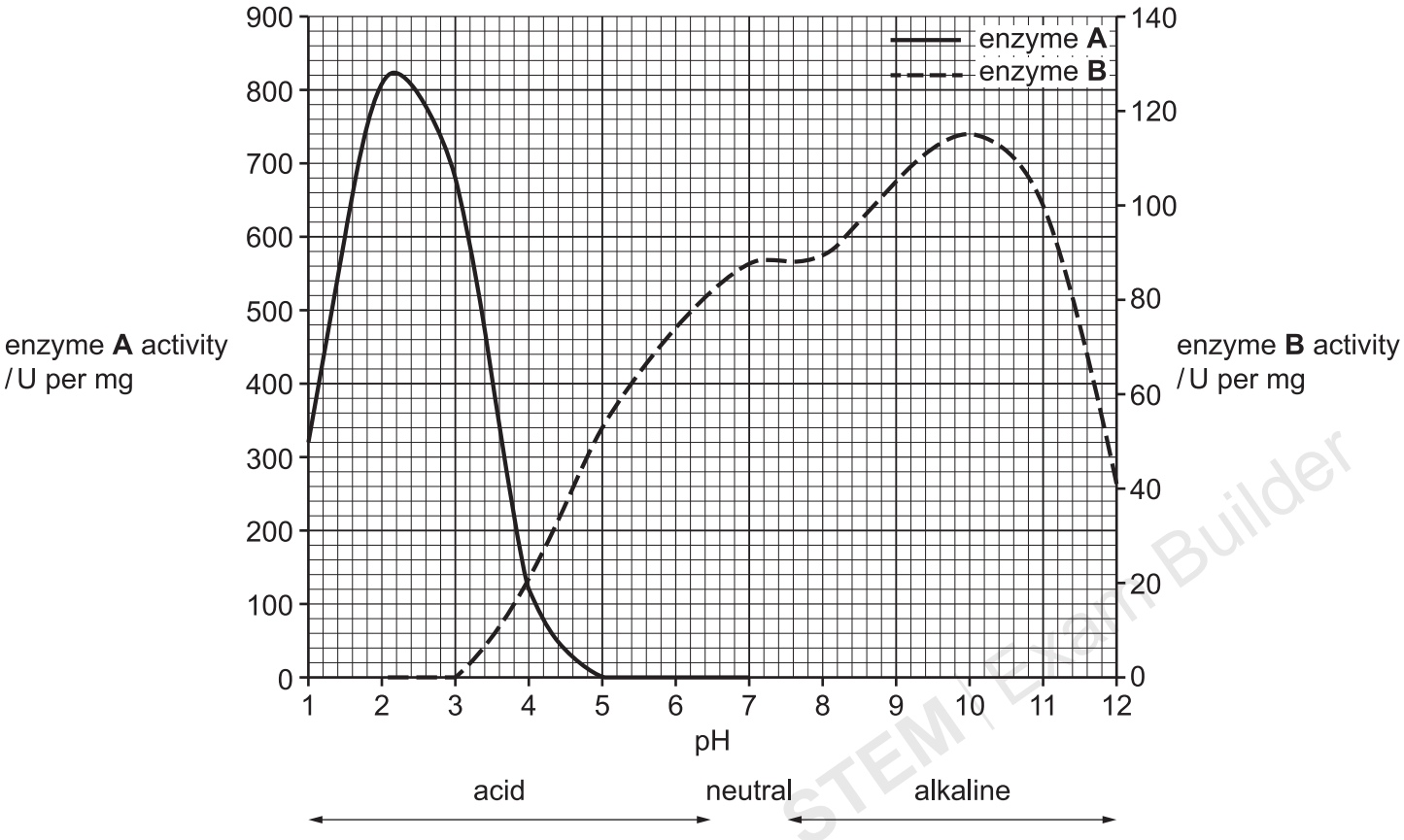


Fig. 2.1

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Describe **and** explain the roles of the two protease enzymes, **A** and **B**, in the alimentary canal.

Use the information in Fig. 2.1 to support your answer.

.....

.....

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.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

(c) Maltase is a digestive enzyme that acts in the small intestine.

State the exact location of maltase in the small intestine.

..... [1]

[Total: 10]

Digestive system, teeth and digestion Click for more variations

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7 A student investigated the digestion of starch.

Fig. 2.1 shows the apparatus she used.

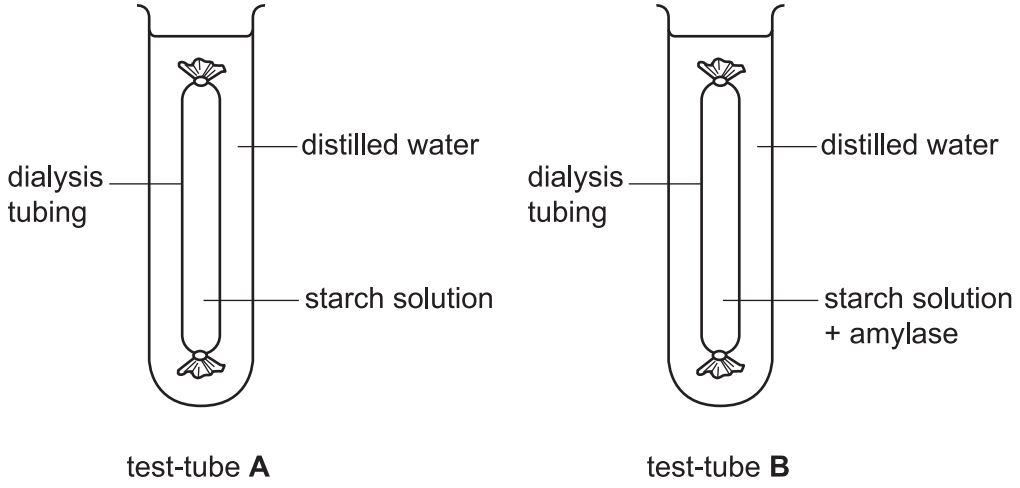


Fig. 2.1

Dialysis tubing is used to represent a cell membrane.

The dialysis tubing material allows small molecules to move across it, but not larger molecules.

Test-tubes **A** and **B** were set up as shown in Fig. 2.1 and placed in a water-bath at 37 °C for 30 minutes.

The liquid outside the dialysis tubing in test-tubes **A** and **B** was tested with Benedict's solution at 0 minutes and after 30 minutes.

Table 2.1 shows the results.

Table 2.1

test-tube	colour with Benedict's solution at 0 minutes	colour with Benedict's solution at 30 minutes
A	blue	blue
B	blue	red

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(a) Using the information in Fig. 2.1 and Table 2.1, explain the reasons for the difference in the results for test-tubes **A** and **B** in Table 2.1.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

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(b) Complete Table 2.2 by writing in the names of the missing enzymes, substrates and products.

Table 2.2

enzyme	substrate	product or products
pepsin		
		fatty acids and glycerol
trypsin		
		glucose

[4]

(c) State the name of the structures that increase the surface area for absorption in the small intestine.

..... [1]

[Total: 11]

Digestive system, teeth and digestion Click for more variations

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8 **(a)** The reactions of chemical digestion are catalysed by enzymes.

Fig. 1.1 shows the stages of an enzyme-catalysed reaction.

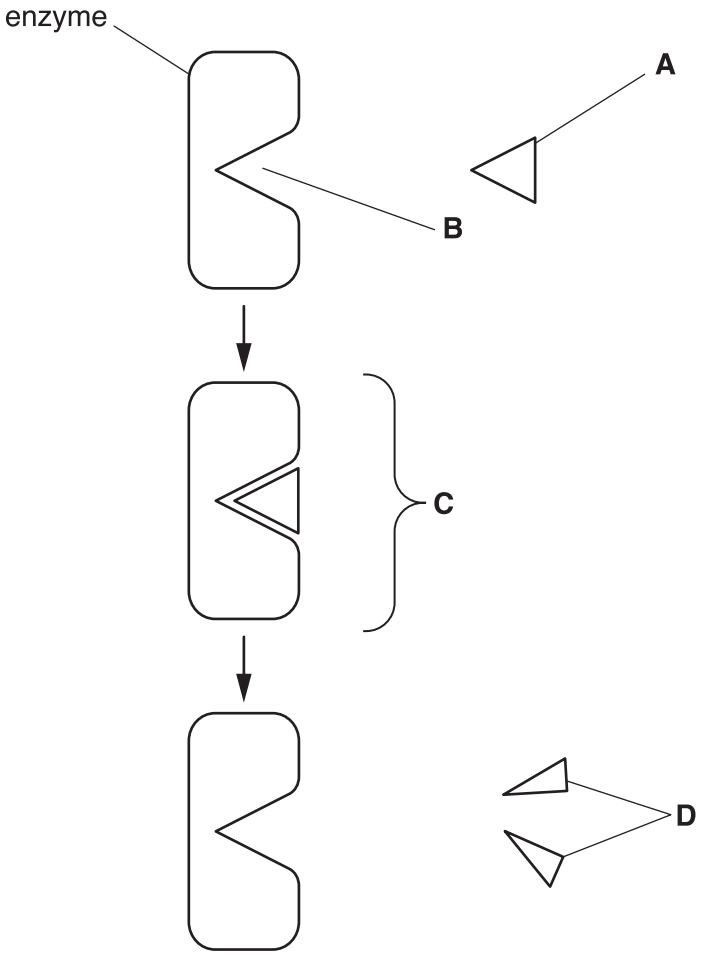


Fig. 1.1

State the names of **A** to **D** in Fig. 1.1.

A .....

B .....

C .....

D .....

[4]

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(b) Explain the importance of chemical digestion.

.....

.....

.....

.....

.....

.....[2]

(c) Fig. 1.2 shows the human alimentary canal and associated organs.

The functions of some of these parts of the body are given in Table 1.1.

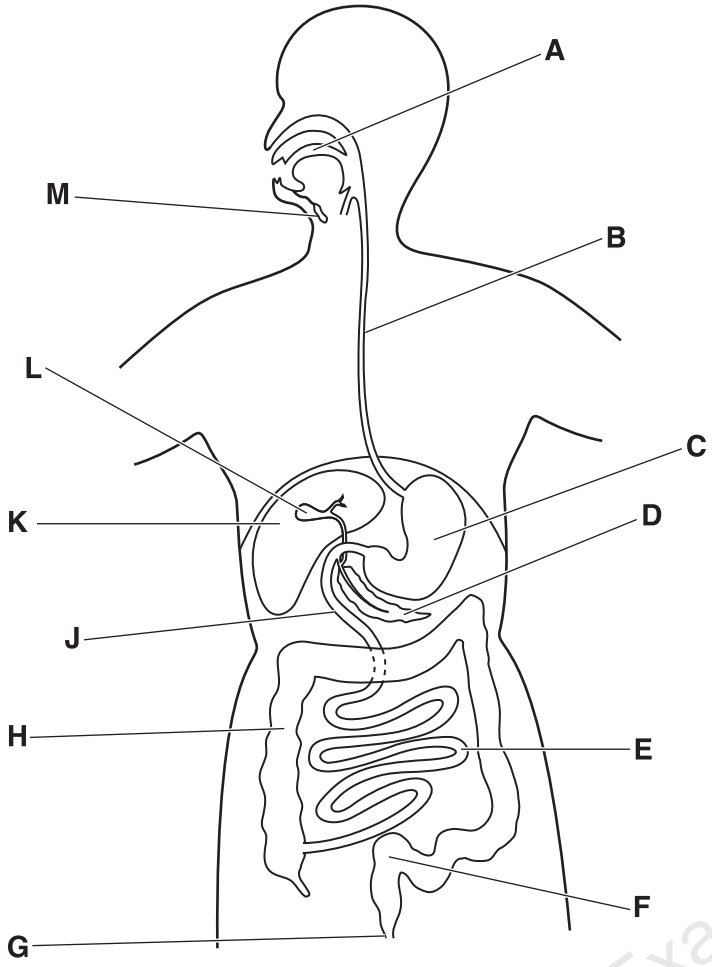


Fig. 1.2

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Complete Table 1.1. One row has been done for you.

Table 1.1

function	letter from Fig. 1.2	name of structure
site of starch digestion		
reabsorption of water		
secretion of pepsin		
site of maltose digestion		
secretion of bile		
storage of faeces	**F**	rectum
secretion of lipase and trypsin		

[6]

[Total: 12]

Digestive system, teeth and digestion Click for more variations

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9 **(a)** Fig. 4.1 is a diagram of the alimentary canal.

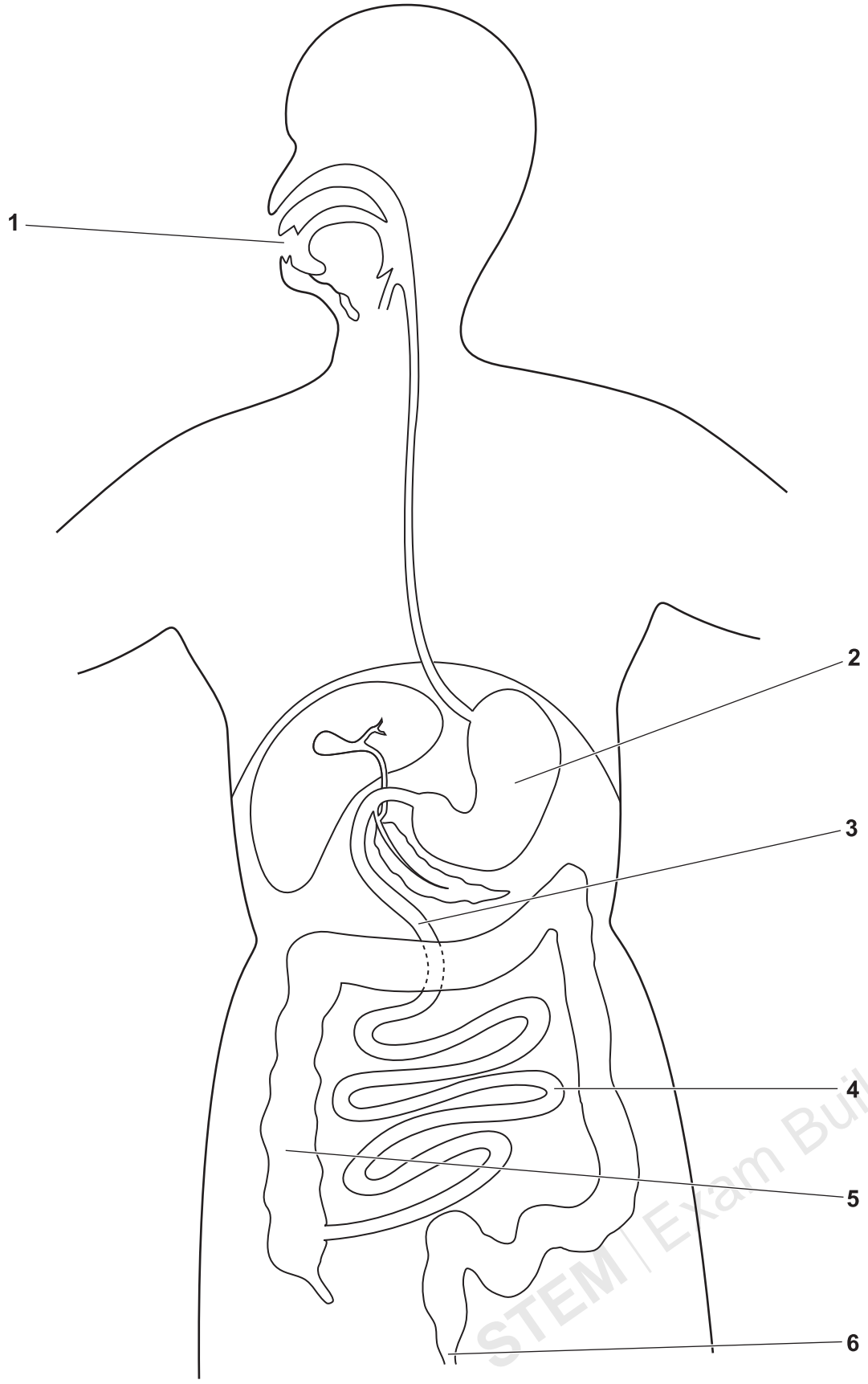


Fig. 4.1

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Complete Table 4.1 by stating:

- the names of the organs from Fig. 4.1
- the letters of **all** the processes shown in the key that occur in each organ.

Key:
A – absorption
C – chemical digestion
E – egestion
I – ingestion
M – mechanical digestion

Table 4.1

number from Fig. 4.1	name of the organ	letter or letters of all the processes that occur in the organ
1		
2		
3		
4		
5		
6		

[6]

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(b) Fig. 4.2 is a diagram of a villus. The arrow indicates the direction of blood flow.

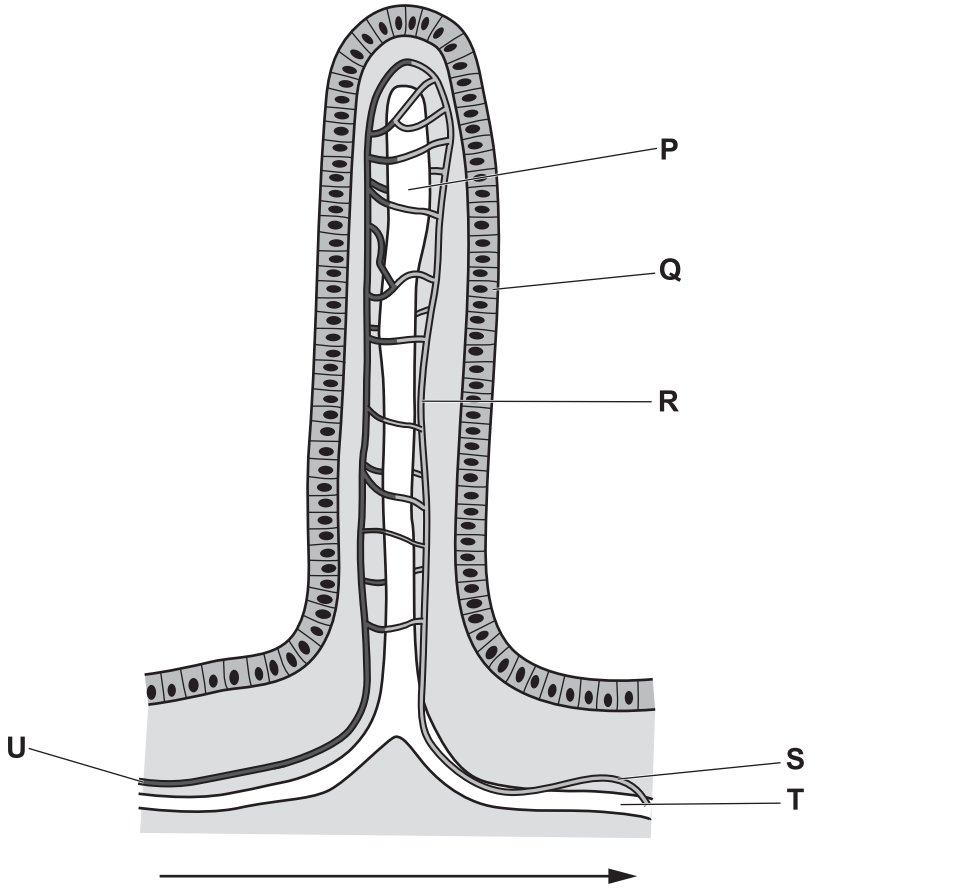


Fig. 4.2

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Describe the structure of a villus **and** its role in the alimentary canal.

Use the letters in Fig. 4.2 to support your answer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

[Total: 12]

Absorption and villi Click for more variations

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10 The length of the small intestine was measured in four types of mammal.
The results are shown in Table 3.1.

Table 3.1

mammal	length of small intestine / cm	length of small intestine relative to body mass / cm per g
insect-eating bat	19	2.30
domestic cat	104	0.05
rat	98	0.34
human	552	0.01

(a) Use the information in Table 3.1 to compare the length of the small intestine of the four mammals.

.....

.....

.....

.....

.....

.....

.....[3]

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(b) Fig. 3.1 is a diagram showing a short length of the small intestine of a mammal.

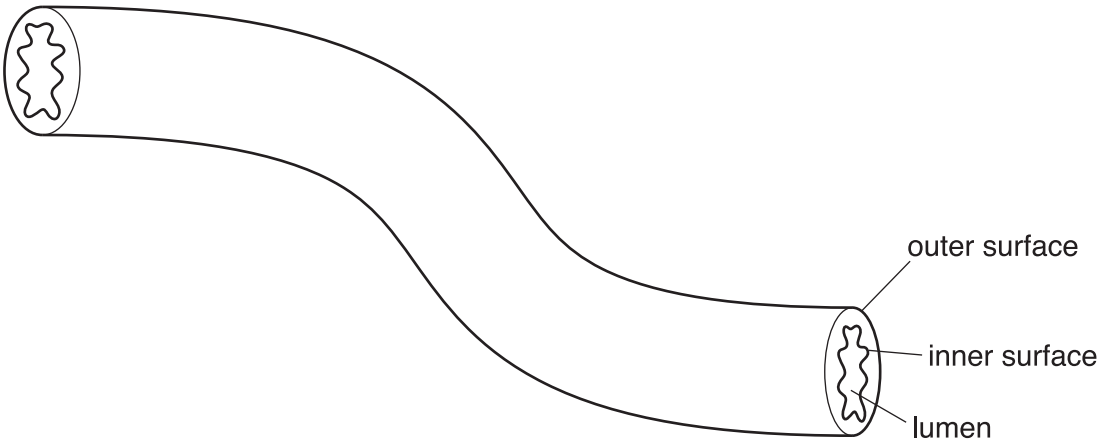


Fig. 3.1

A function of the small intestine is absorption.

Describe how a molecule of glucose passes from the lumen of the small intestine into the blood.

.....

.....

.....

.....

.....

.....

.....[3]

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(c) Measurements were taken of the inner and outer surface area of two parts of the small intestine for the four mammals in Table 3.1. The results are shown in Table 3.2.

Table 3.2

mammal	ratio of inner surface area to outer surface area	
	duodenum	ileum
insect-eating bat	283:1	54:1
domestic cat	15:1	12:1
rat	6:1	4:1
human	7:1	3:1

(i) Suggest which mammal has the most villi per centimetre of small intestine.

.....[1]

(ii) The duodenum is more effective than the ileum at absorption. Use the information in Table 3.2 to explain why.

.....

.....

.....

.....

.....[3]

(d) Bile is released into the small intestine from the gall bladder.

Outline the roles of bile.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 14]

Absorption and villi Click for more variations

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