



Q1. a) Define the term chemical digestion.

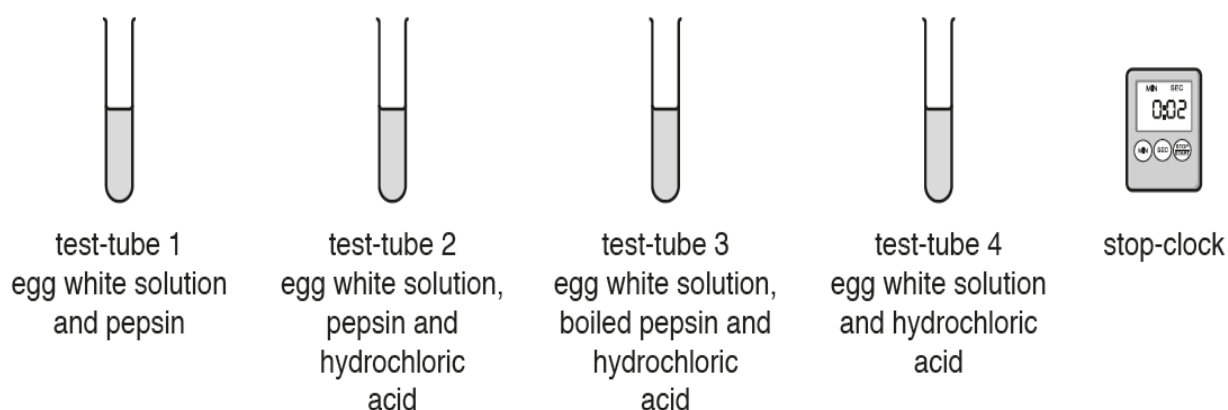
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b). A student investigated the activity of the digestive enzyme pepsin.

Figure shows the apparatus used in the investigation.



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 shows the results.

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.

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(ii) Explain the purpose of test-tube **4**.

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

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C) Maltase is another digestive enzyme.

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

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2. a) Explain the importance of chemical digestion.

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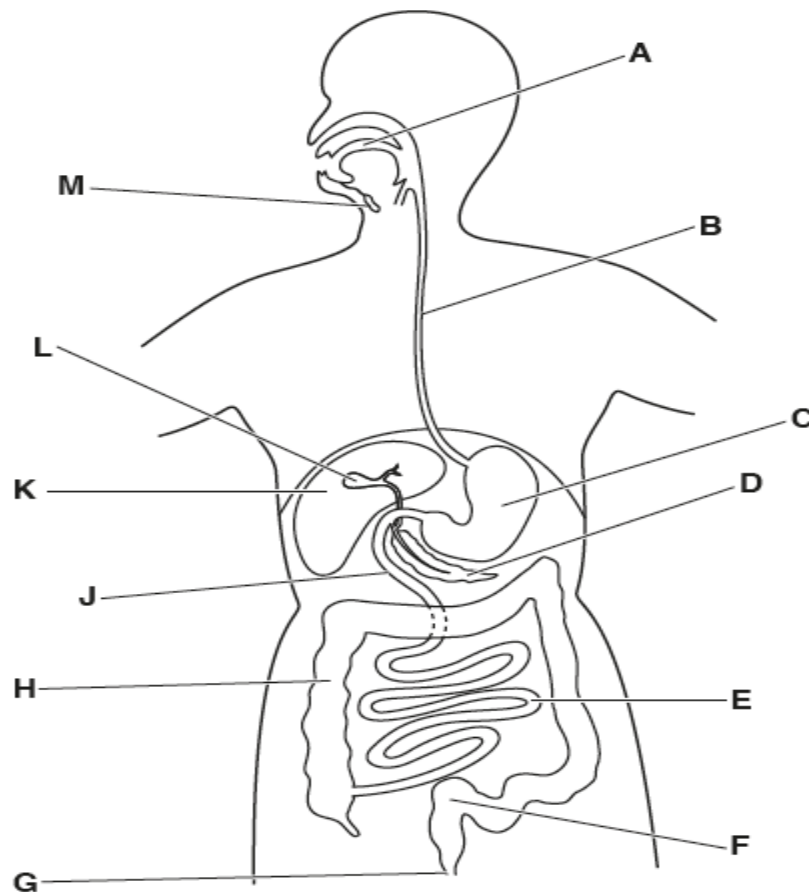
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b) Figure shows the human alimentary canal and associated organs.

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





Complete Table. One row has been done for you.

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		

3.a) Red pandas, *Ailurus fulgens*, and humans have a similar arrangement of teeth.

Figure shows a section through one tooth of a red panda. Figure shows the side view of the lower jaw of a red panda.

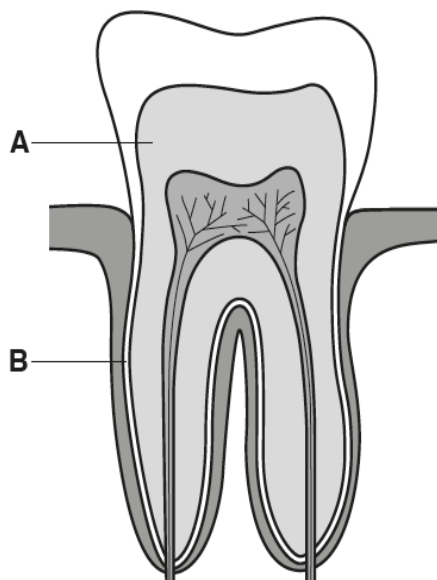


Fig. 1.1

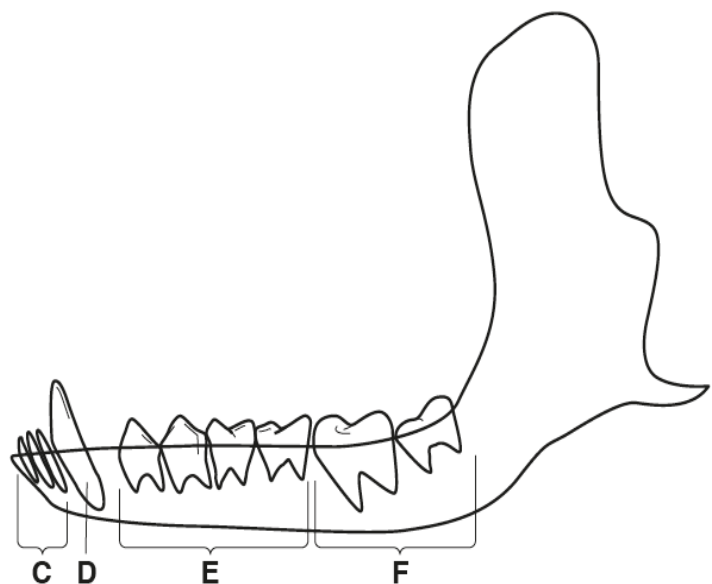


Fig. 1.2



(i): State the names of the structures labelled **A** to **F** in Figure 1 and Figure 2.

A.....

B.....

C.....

D.....

E

F

ii): State the type of digestion that breaks down large pieces of food.

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b) Food that sticks to the teeth can be used by bacteria for anaerobic respiration.

This type of respiration releases a substance that can cause tooth decay.

(i) State the type of substance released by the bacteria, during respiration, that causes tooth decay.

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(ii) State the names of the **two** parts of a tooth that are dissolved by the substance released by bacterial respiration.

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c) The teeth of red pandas do not decay as much as human teeth.

Suggest the component of a human diet that causes teeth to decay as a result of bacterial respiration.

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4: Two functions of the alimentary canal are mechanical digestion and chemical digestion.

(a) Outline where **and** how mechanical digestion occurs in the alimentary canal.

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b) Enzymes catalyse the reactions of chemical digestion. Table gives information about chemical digestion in three parts of the alimentary canal.

Complete Table.

Table 1.1

part of the alimentary canal	enzyme	substrate	product(s)
mouth		starch	
stomach			peptides
		fat	fatty acids and glycerol



(c) Substances that are absorbed from the alimentary canal may enter cells and become part of the cells.

(i): State the storage carbohydrate made from glucose in liver cells.

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(ii): State the type of protein used in the immune system that is produced from amino acid by lymphocytes.

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(iii): Fat is produced from fatty acids and glycerol by cells in the fatty tissue beneath the skin.

State **one** function of this layer of fat.

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5): Name the organ that breaks down alcohol in the human body.

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6): Bile is made in the liver, stored in the gall bladder and passes into the small intestine.

(a): Describe the role of bile in digestion.

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b): After chemical digestion the products of digestion are absorbed.

Define *absorption*.

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c): Lack of protein in the diet can result in protein-energy malnutrition.

State the name of **one** disease caused by protein-energy malnutrition.

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d): People that eat a diet that is high in fats are often advised to reduce their intake of fats.

Suggest the health benefits of this change in diet.

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7): Fat is a necessary component of the human diet.

(a): State **three** ways in which the human body uses fat.

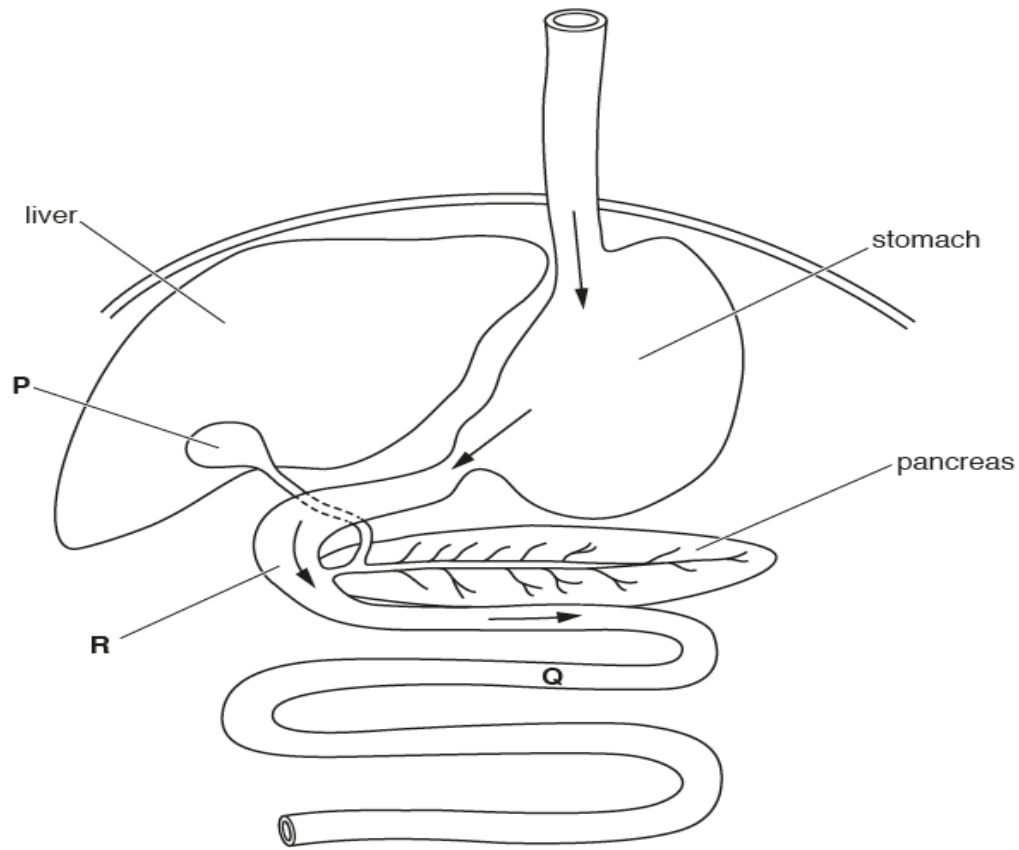
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The arrows in Figure show the pathway of fat in part of the alimentary canal.



b): State the name of

(i): the enzyme secreted by the pancreas that digests fat

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(ii): the products of chemical digestion of fat

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(iii): the liquid that is produced by the liver and stored by organ **P** in Figure.

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(iv): organ **P** in Figure.

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C): Explain what happens to ingested fat at **R** in Figure **before** chemical digestion occurs.

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D): Explain how the products of fat digestion are transported from **Q** to the rest of the body.

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8): A balanced diet is required to ensure healthy weight gain as children grow.

(a) Explain the term *balanced diet*.

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b) A doctor diagnosed a young child with marasmus.

Describe the symptoms of marasmus.

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c): The child with marasmus was put on a special diet.

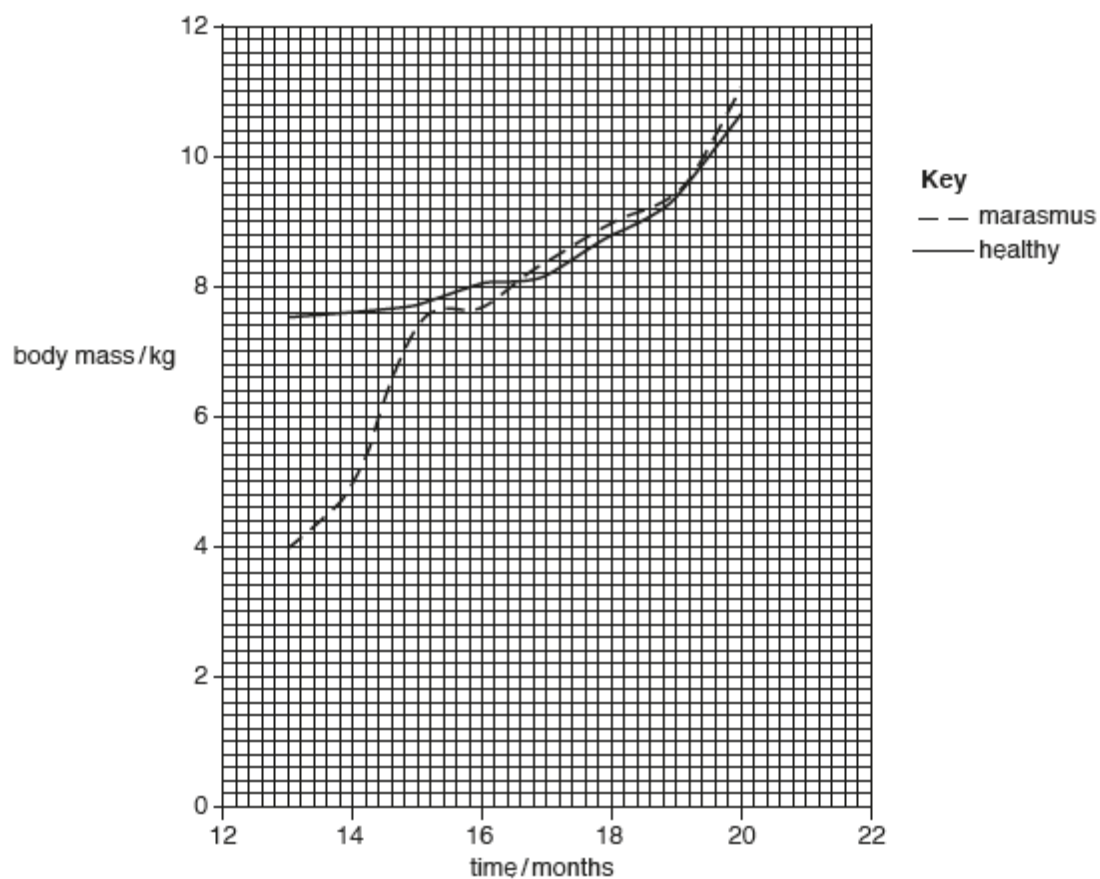
He was given fortified milk, which is milk that has extra nutrients added to it.

The child was encouraged to drink as much fortified milk as he wanted over a period of seven months.

Table shows the composition of the fortified milk given to the child and the composition of cow's milk for comparison.

type of milk	milk composition			
	percentage of protein	percentage of carbohydrate	percentage of fat	energy /kJ dm ⁻³
fortified milk	16.5	57.0	17.0	5468
cow's milk	3.3	4.6	3.9	2845

The body mass of the child who had marasmus and the mean body mass of healthy children of the same age were recorded. The data is shown in Figure.





Using the information in Table and Figure describe **and** explain the importance of diet when treating children affected by marasmus.

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d): It is important that children with marasmus produce enough bile.

Describe the role of bile in the digestion of fats.

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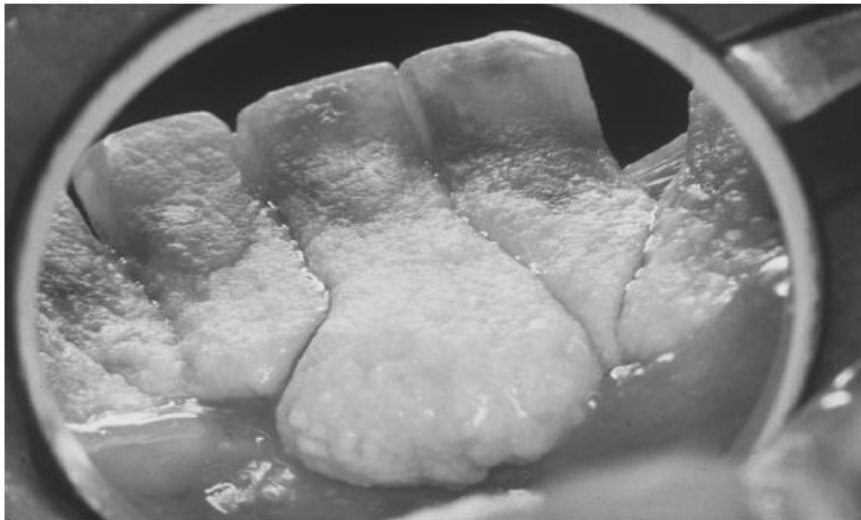
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9a): Figure shows some human teeth that require dental treatment.



(i): Identify the type of teeth in Figure.

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(ii): Explain how bacteria dissolve enamel to cause tooth decay.

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b): Describe **two** ways of preventing tooth decay.

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10 a): A type of anaemia is caused by a dietary deficiency.

(i): State the nutrient that is deficient in the diet when this type of anaemia occurs.

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(ii): State **two** symptoms of anaemia.

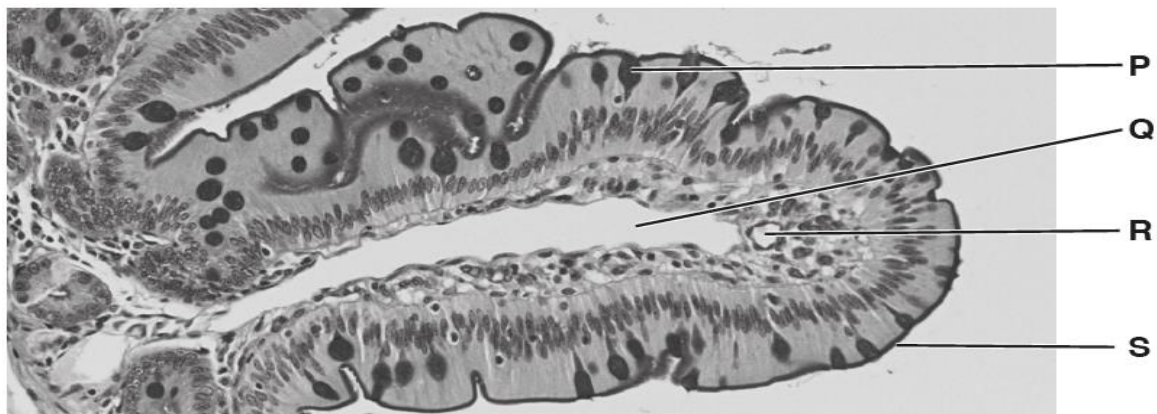
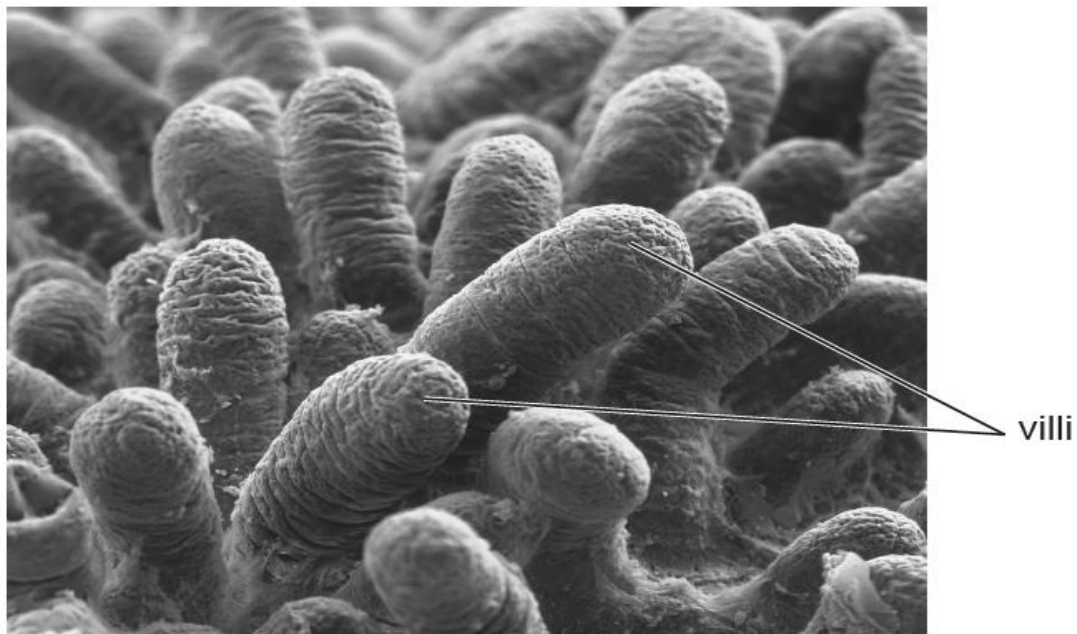
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11: Figure and Figure show two images of villi.

Figure shows a surface view of many villi viewed through a scanning electron microscope.

Figure shows a section of one villus viewed through a light microscope.



Villi are found in the small intestine.

(a) State the function of villi.

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b) Identify and describe **two** of the labelled components of a villus.

Use the letters in Figure 2 in your answer.

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(C): Some infections in the small intestine can cause diarrhoea.

(i) Describe the effects of diarrhoea on the body.

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(ii) State the treatment for the effects of severe diarrhoea.

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12) State the name of **one** part of the mammalian body **other than** the kidney that has cells with microvilli.

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13) State **one** natural body defence that is found in the stomach.

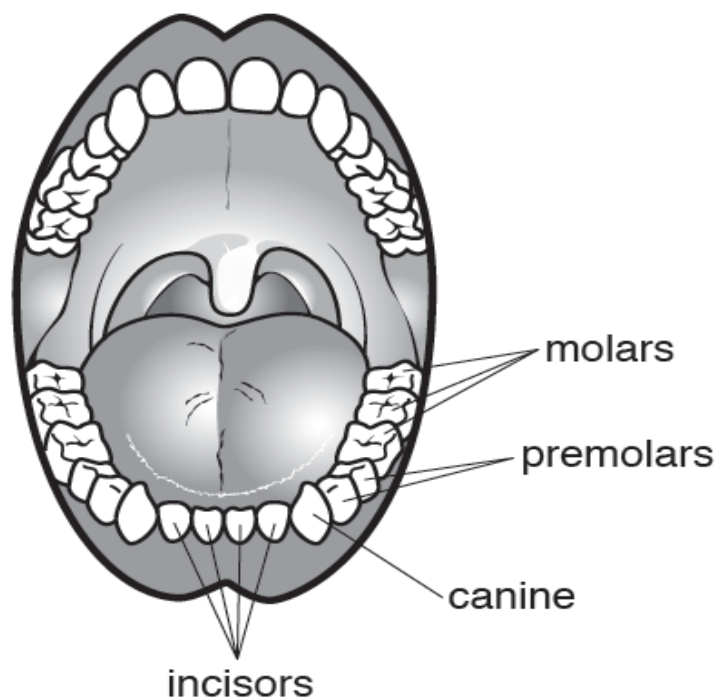
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**14)** Mineral ions are needed for plant growth.

Complete Table to show the function and effect of the lack of some mineral ions on plants.

One has been done for you.

mineral ion	function in plants	effect of lack of mineral ion on plants
nitrate		
magnesium		
phosphate	used for making DNA	poor root growth

15: Figure shows the different types of human teeth.



(a) Describe the functions of the canine and molar teeth.

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(b) Figure shows the skulls of a tiger and a rabbit.



tiger



rabbit

(i): State **two** ways in which the teeth of a tiger differ from the teeth of a rabbit, using evidence from figure.

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(ii) Suggest **one** feature **visible** in Figure that indicates the tiger is a carnivore.

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C): Omnivores are animals that eat both animals and plants. Scientists use the number and types of teeth to classify animals as carnivores, herbivores or omnivores.

Table shows examples of different types of mammals and their teeth.

mammal	carnivore, herbivore or omnivore	incisors	canines	premolars	molars	total number of teeth
1	omnivore	12	4	16	12	
2	omnivore	12	4	16	12	44
3	herbivore	12	4	12	12	40
4	herbivore	6	2	12	12	32
5	carnivore	12	4	16	10	42
6	carnivore	12	4	10	8	34
X		12	4	12	8	36

(i): Calculate the number of molars as a percentage of the total number of teeth for mammal 1.

Show your working.

Give your answer to the nearest whole number.

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(ii): The skull of an unidentified mammal, X, is likely to be a carnivore.

Discuss the evidence in Table for **and** against classifying mammal X as a carnivore.

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d): Mechanically digested food travels from the mouth to the stomach. The gastric juice in the stomach contains hydrochloric acid, giving a low pH environment.

Explain why it is important to have a low pH in the stomach.

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e): Products of digestion are absorbed through the villi in the small intestine.

Explain how villi are adapted for absorption.

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f): Coeliac disease is caused by a reaction to a protein called gluten. The villi become damaged causing a reduction in the absorption of nutrients.

Suggest possible effects on the body of a reduction in the absorption of nutrients.

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16: The loss of chloride ions from cells causes diarrhoea and dehydration in patients with cholera.

(i) State which organ in the alimentary canal is affected by the cholera toxin.

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(ii) Describe the treatment for cholera.

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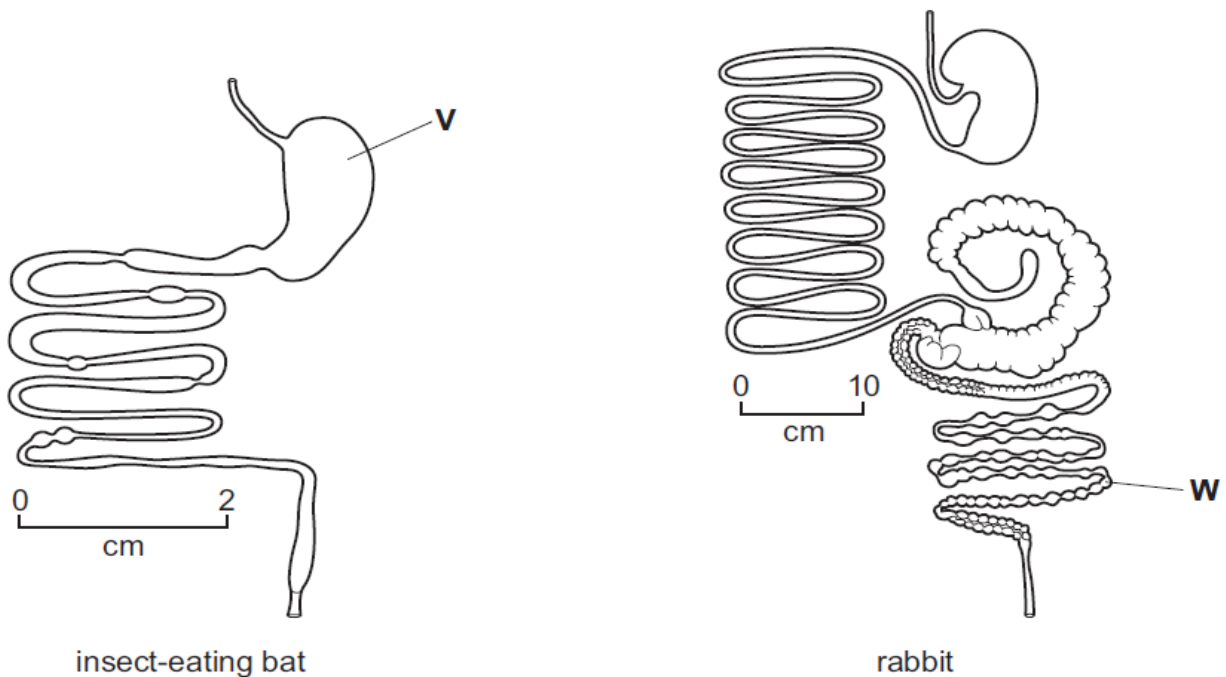
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17: Figure shows the alimentary canals of two mammals, an insect-eating bat, which is a carnivore, and a rabbit, which is a herbivore.



(a): Name the organs labelled **V** and **W**.

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W.....

(b): Explain the role of mechanical digestion.

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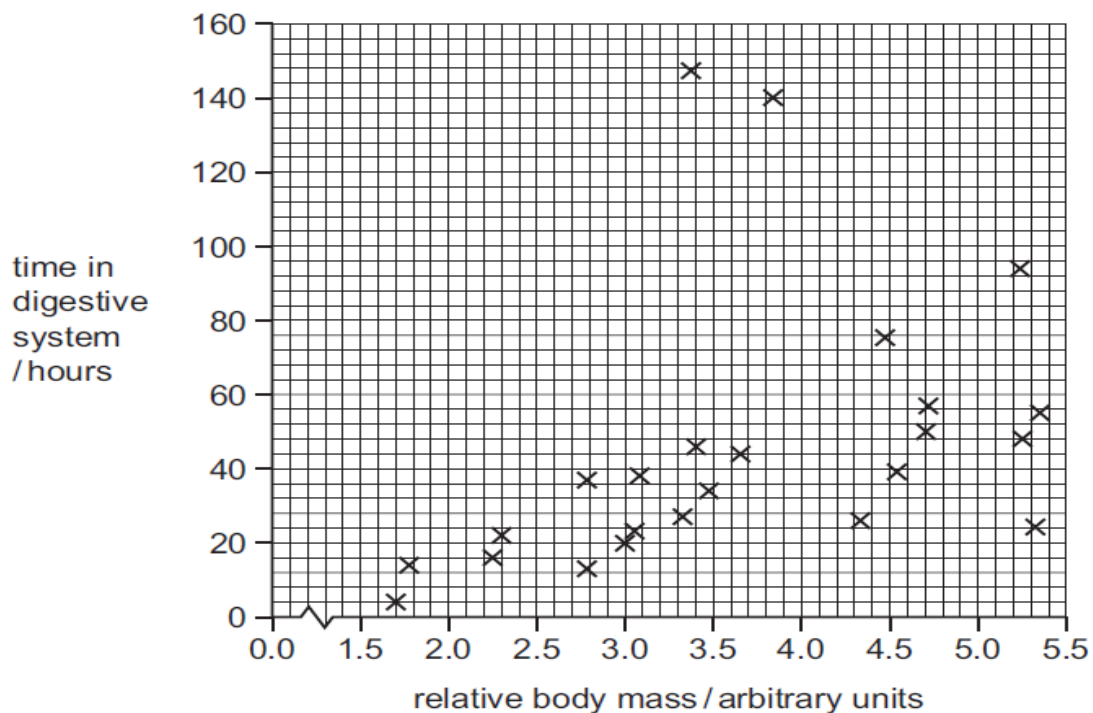
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C): Scientists investigated digestion in different species of mammal. The mammals that they studied ranged in size from an elephant shrew, *Elephantulus edwardii*, with a mass of 50 g to an ox, *Bos Taurus*, with a mass of 220 kg.

The scientists added indigestible particles to the animals' food and timed how long the particles stayed in the digestive system.

The results for 24 different mammal species are shown in Figure.



The scientists concluded that food stays longer in the digestive systems of larger mammals compared with smaller mammals.

Discuss the evidence from Figure for **and** against the statement that food stays longer in the digestive systems of larger mammals.

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18): Pepsin is a protease enzyme found in the alimentary canal.

(a) (i): Name the product formed from the digestion of proteins by protease enzymes.

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(ii): State the organ in the alimentary canal where pepsin is secreted.

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19a): Humans need vitamin D as part of their diet.

(i) Describe a cause of vitamin D deficiency in humans.

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(ii) Describe the effects of vitamin D deficiency in humans.

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Scientists have found that mice can suffer from Type 1 diabetes. They also found that vitamin D affects the development of Type 1 diabetes in mice.

Two groups of mice were studied. One group were normal and the other group were vitamin D-deficient. The percentage of mice in each group that developed Type 1 diabetes was recorded every fifty days.

Table shows their results.

age / days	percentage of mice with Type 1 diabetes	
	normal mice	vitamin D-deficient mice
0	0	0
50	1	1
100	8	35
150	34	62
200	45	65
250	46	65

b): Describe the effect of vitamin D deficiency on the development of Type 1 diabetes in mice.

Use the data in Table to support your answer.

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c): Suggest the symptoms that mice with Type 1 diabetes would have.

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20.a): Protein digestion begins in the stomach of the human alimentary canal and is completed in the small intestine.

Describe in detail how enzymes function to digest protein in the alimentary canal.

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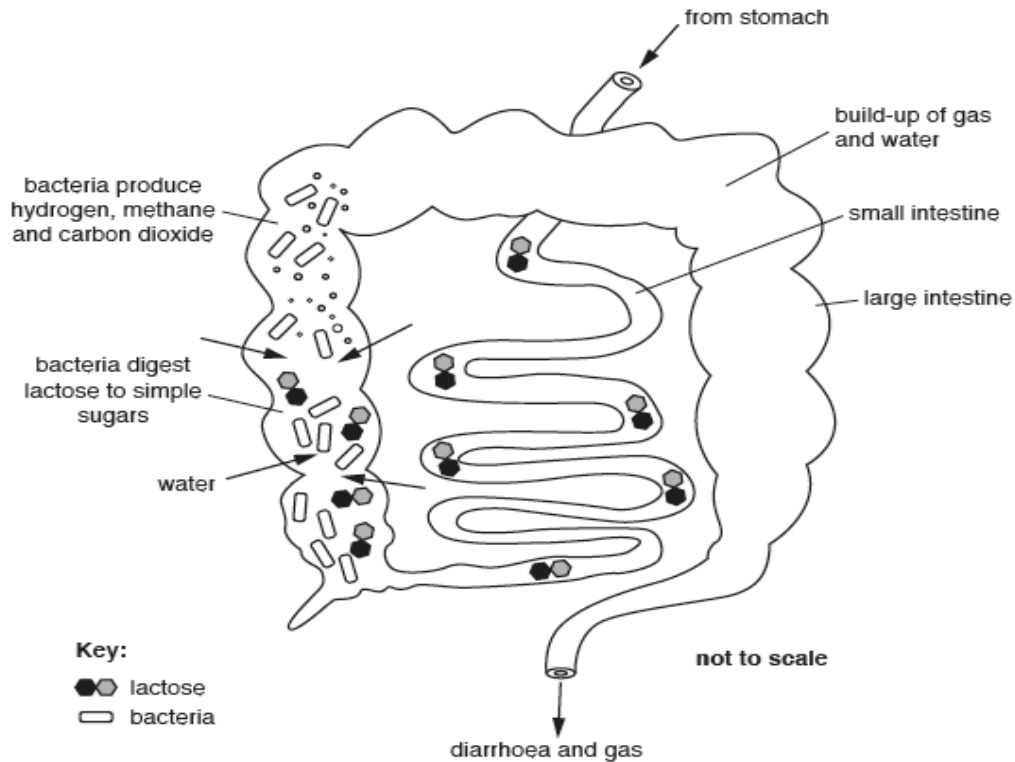
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b): Some people are unable to digest lactose (milk sugar) and have a condition known as lactose intolerance.

Figure shows what happens in the intestine of a person who is lactose intolerant if they eat food containing a lot of lactose.



(i): Explain why lactose is not absorbed by the small intestine.

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(ii): Suggest the dangers to health of severe diarrhoea if it is not treated for a long time.

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21): The length of the small intestine was measured in four types of mammal.

The results are shown in Table.

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 to compare the length of the small intestine of the four mammals.

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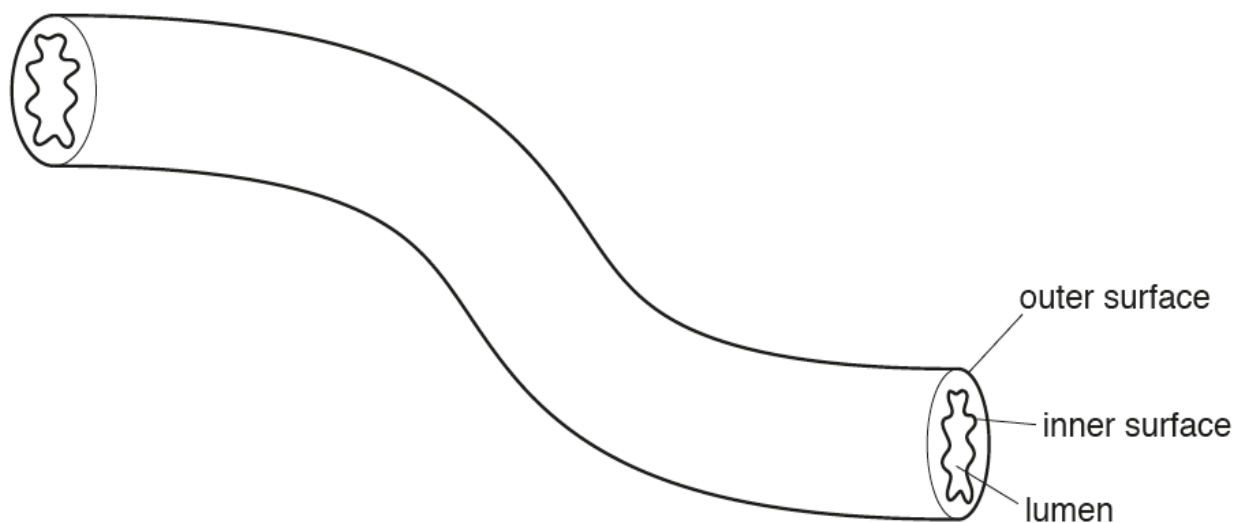
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Figure is a diagram showing a short length of the small intestine of a mammal.





A function of the small intestine is absorption.

(b): Describe how a molecule of glucose passes from the lumen of the small intestine into the blood.

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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. The results are shown in Table

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.

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(ii): The duodenum is more effective than the ileum at absorption.
Use the information in

Table to explain why.

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(d) Bile is released into the small intestine from the gall bladder. Outline the roles of bile.

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