

Chapter 7

Human nutrition



Ace | GCSE

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01. 0610_m20_qp_42 Q: 4

(a) Describe the similarities and differences between marasmus and kwashiorkor.

similarities

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differences

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.....

[4]

(b) Researchers at a hospital recorded the total number of children admitted to the hospital between 1984 and 2002.

A common reason for children being admitted to this hospital was severe diarrhoea.

Table 4.1 shows this information.

Table 4.1

year	total number of children admitted to the hospital
1984	1386
1986	1604
1988	1955
1990	2054
1992	1726
1994	1143
1996	1422
1998	1419
2000	1580
2002	1161

- (i) Calculate the percentage decrease in the total number of children admitted to the hospital between 1998 and 2002.

Give your answer to the nearest whole number.

Space for working.

..... %
[3]

- (ii) Health workers in the communities near the hospital were trained in the prevention and treatment of diarrhoea. This affected the total number of children being admitted to the hospital.

Suggest the year in which the training took place.

Give a reason for your answer.

year

reason

.....

..... [2]

- (iii) The health workers provided advice to the community on ways of preventing the spread of the pathogens that cause diarrhoea.

Suggest the advice that was given to the community.

.....

.....

.....

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.....

.....

..... [3]

[Total: 12]

02. 0610_s16_qp_43 Q: 6

Fig. 6.1 shows the alimentary canals of two mammals, an insect-eating bat, which is a carnivore, and a rabbit, which is a herbivore.

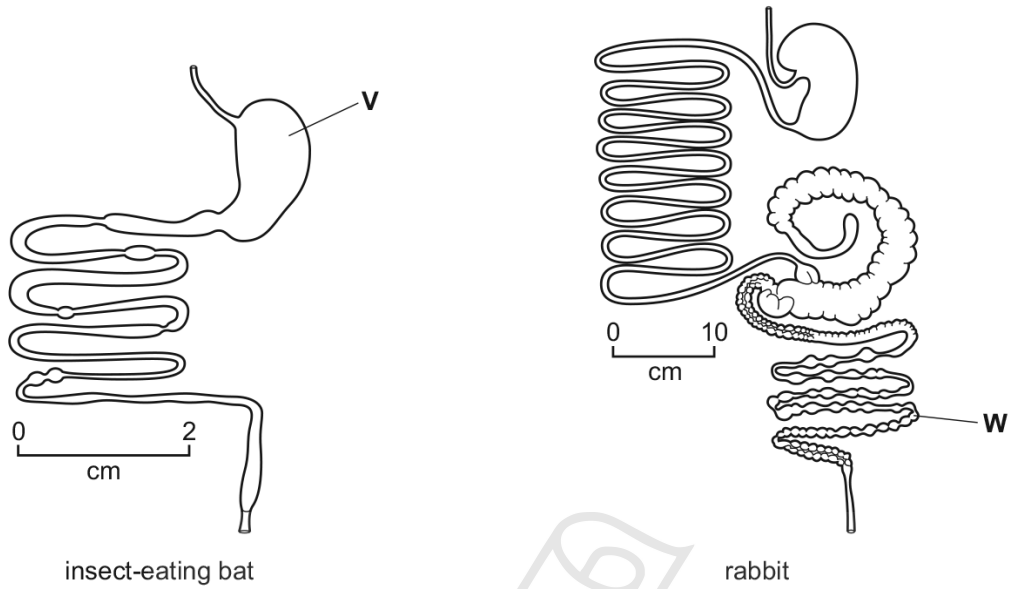


Fig. 6.1

(a) Name the organs labelled V and W.

V

W

[2]

(b) Explain the role of mechanical digestion.

.....

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.....

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.....

.....

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.....

[3]

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 Fig. 6.2.

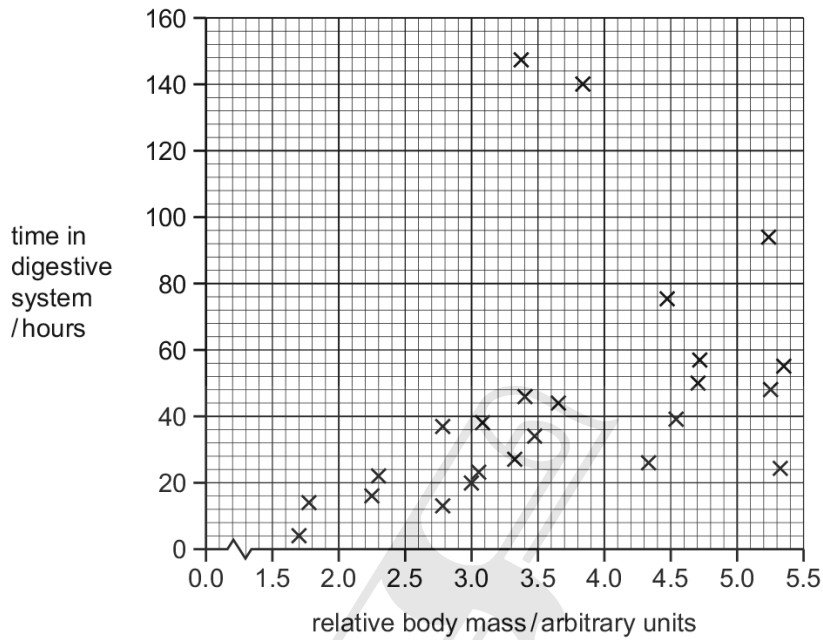


Fig. 6.2

Fig. 6.1 is a photomicrograph of part of a cell from the pancreas that produces enzymes that are released into the small intestine.



Fig. 6.1

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- (a) (i) Structure **Q** is part of the nucleus of the cell.

State **one** function of a nucleus.

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

- (ii) State the names of the structures labelled **P** and **R** in Fig. 6.1.

P
R [2]

- (b) The structure labelled **S** transports enzymes to the cell membrane for release into the pancreatic duct. These structures contain molecules of amylase, trypsin and lipase.

Complete the sentences with the most appropriate words.

Enzymes are made of protein and act as because they increase the rate of chemical reactions, but are not changed in those reactions. Amylase speeds up the digestion of to Trypsin continues the chemical digestion of protein begun by the enzyme in the stomach.

The optimum pH for pancreatic enzymes is greater than pH7. Bile is produced by the and enters the small intestine, where it stomach acid to provide the appropriate pH. Bile also breaks down fat by to increase the surface area for the action of lipase.

[7]

[Total: 10]

(a) Define the term *chemical digestion*.

.....

[2]

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

Fig. 6.1 shows the apparatus used in the investigation.

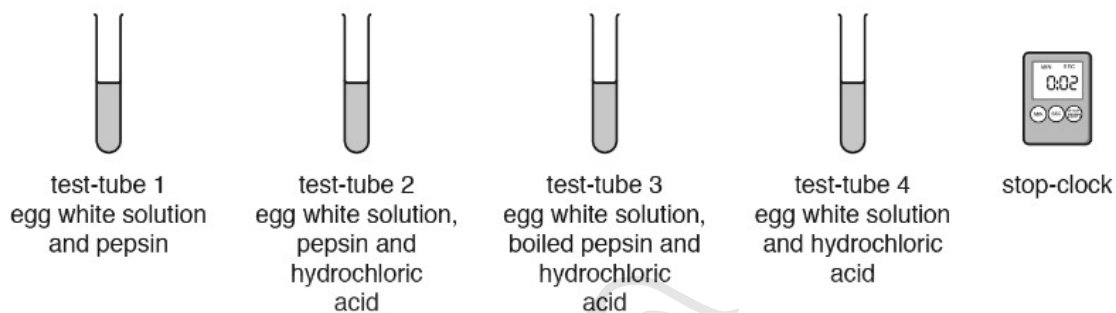


Fig. 6.1

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

05. 0610_s18_qp_41 Q: 1

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

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

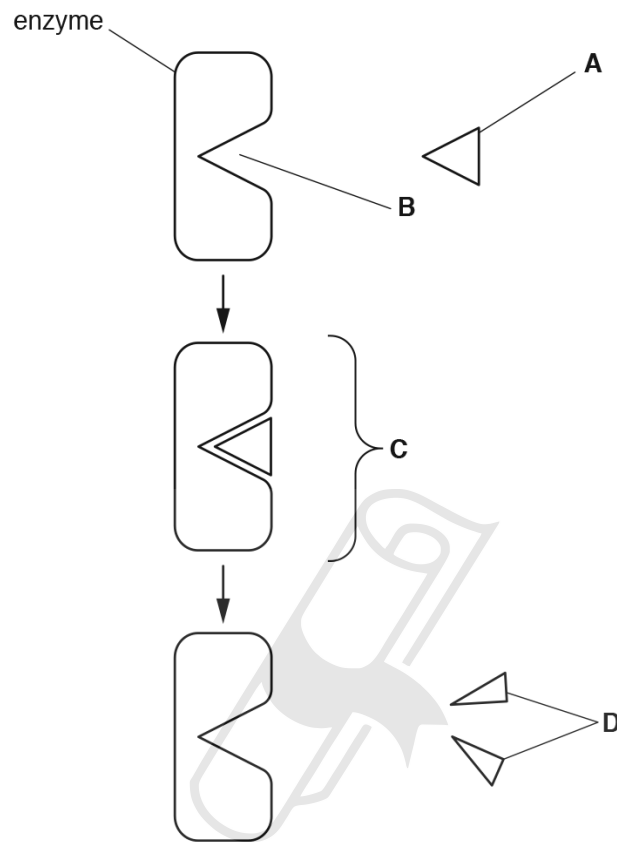


Fig. 1.1

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

- A
- B
- C
- D

[4]

(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.

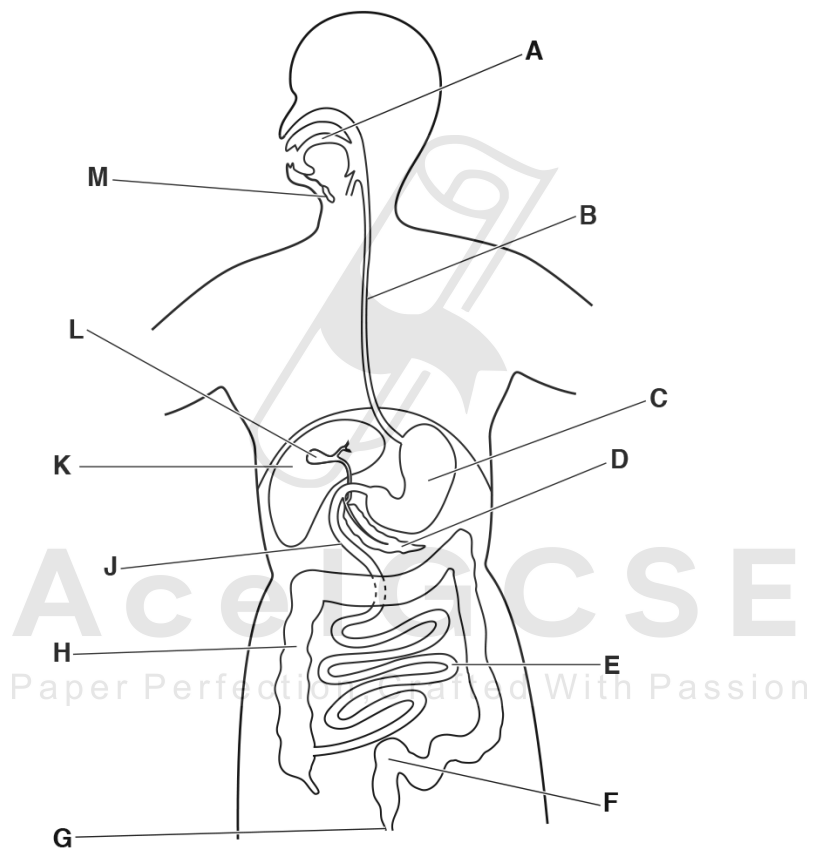


Fig. 1.2

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]



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- (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.
.....[1]
 - (ii) State the type of protein used in the immune system that is produced from amino acids by lymphocytes.
.....[1]
 - (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.
.....[1]

[Total: 10]

07. 0610_s17_qp_42 Q: 4

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

- (a) Explain the term *balanced diet*.
.....
.....
.....
.....
.....[3]
- (b) A doctor diagnosed a young child with marasmus.
Describe the symptoms of marasmus.
.....
.....
.....
.....
.....
.....
.....
.....
.....[3]

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

Table 4.1

type of milk	milk composition			
	percentage of protein	percentage of carbohydrate	percentage of fat	energy/ kJdm^{-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 Fig. 4.1.

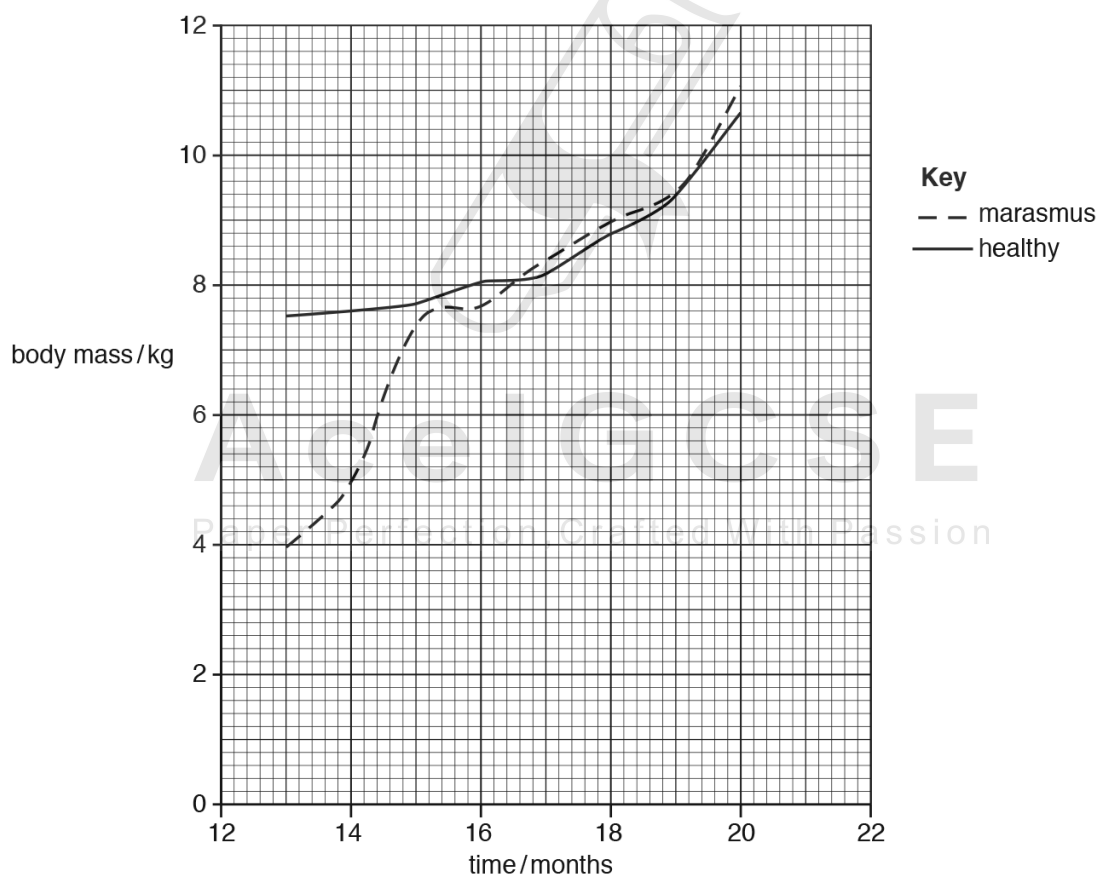


Fig. 4.1

Pepsin is a protease enzyme found in the alimentary canal.

(a) (i) Name the product formed from the digestion of proteins by protease enzymes.
.....[1]

(ii) State the organ in the alimentary canal where pepsin is secreted.
.....[1]

(b) A biologist performed an experiment to find the optimum pH for the activity of pepsin.

The enzyme activity was measured in four test-tubes. Each test-tube contained a 1 cm³ cube of cooked egg white which contains protein.

Fig. 3.1 shows the four test-tubes.

The biologist measured the time taken for the complete digestion of the cubes of cooked egg white.

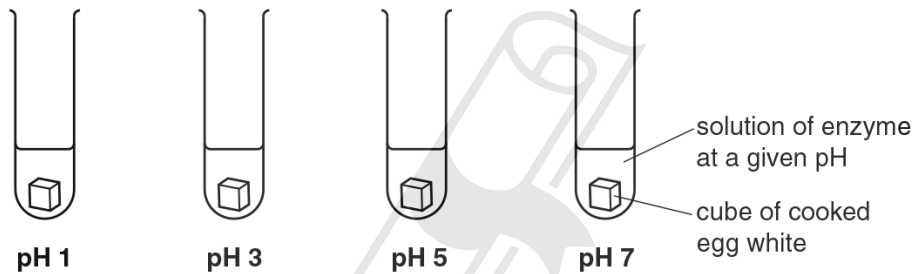


Fig. 3.1

(i) The biologist ensured all the cubes of cooked egg white were exactly the same size.

Suggest why.

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

(ii) Temperature must be controlled in this experiment.

Describe how temperature could be controlled.

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

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

Fig. 1.1 shows what happens in the intestine of a person who is lactose intolerant if they eat food containing a lot of lactose.

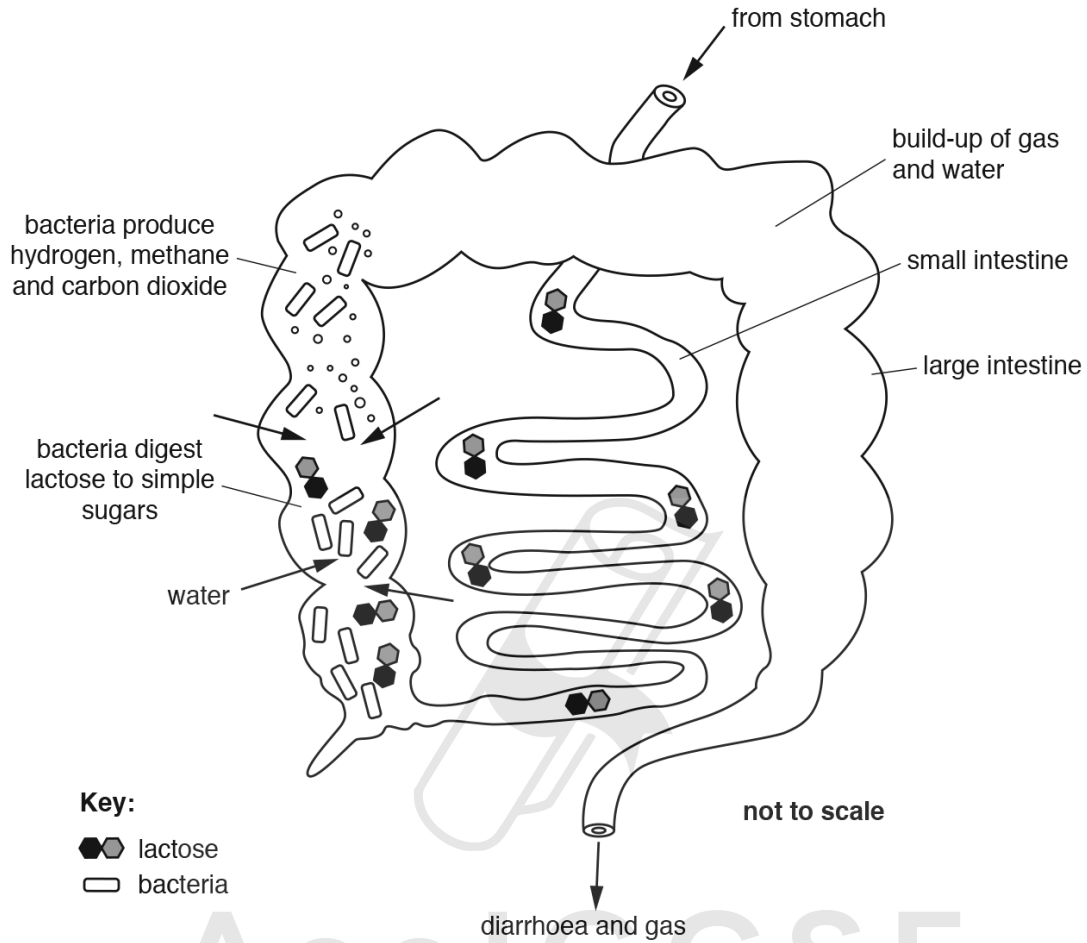


Fig. 1.1

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

.....

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.....

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..... [2]

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

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

(d) Hydrogen gas is produced by the bacteria that digest lactose in the large intestine. The gas is absorbed into the blood and excreted through the lungs. Lactose intolerance can be monitored by measuring the hydrogen gas content of the air a person breathes out.

People taking part in an investigation into lactose intolerance consumed the following milk products on different days:

- A. untreated milk
- B. milk treated with lactase immediately before drinking
- C. milk treated with lactase three days before drinking
- D. yoghurt made by bacteria that digested the lactose in the milk

The hydrogen gas content of the air breathed out was measured every hour for five hours following the ingestion of each milk product.

The mean results are shown in Fig. 1.2.

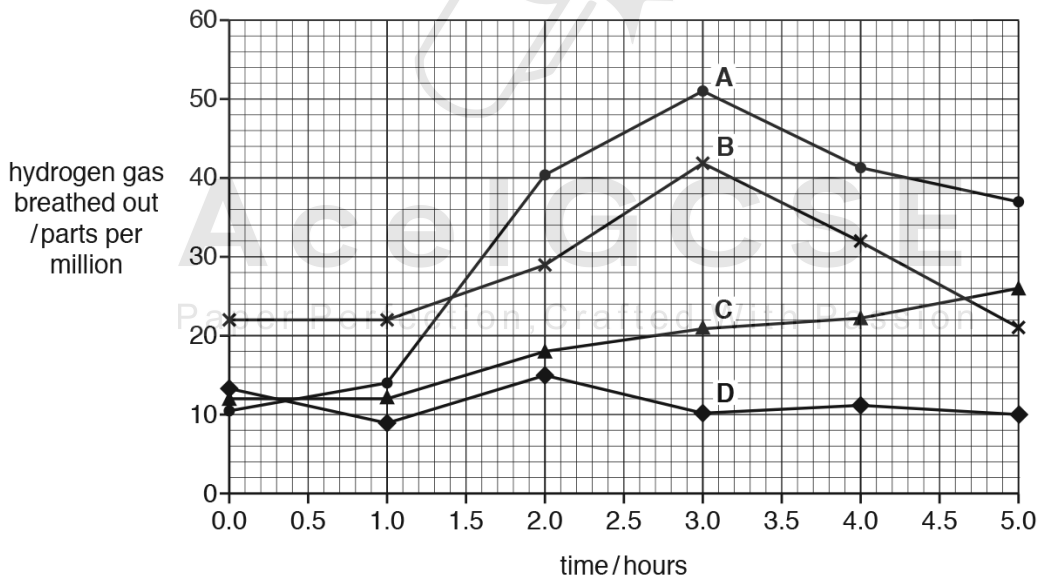


Fig. 1.2

(i) Explain why untreated milk was included in the investigation.

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..... [2]

(ii) Suggest why lactase might be added to milk.

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..... [2]

(iii) Use the results in Fig. 1.2 to explain why yoghurt is the best milk product for people with lactose intolerance.

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

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[Total: 21]

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Fig. 6.1 shows a villus from the small intestine of a mammal and an enlarged view of a cell from region A.

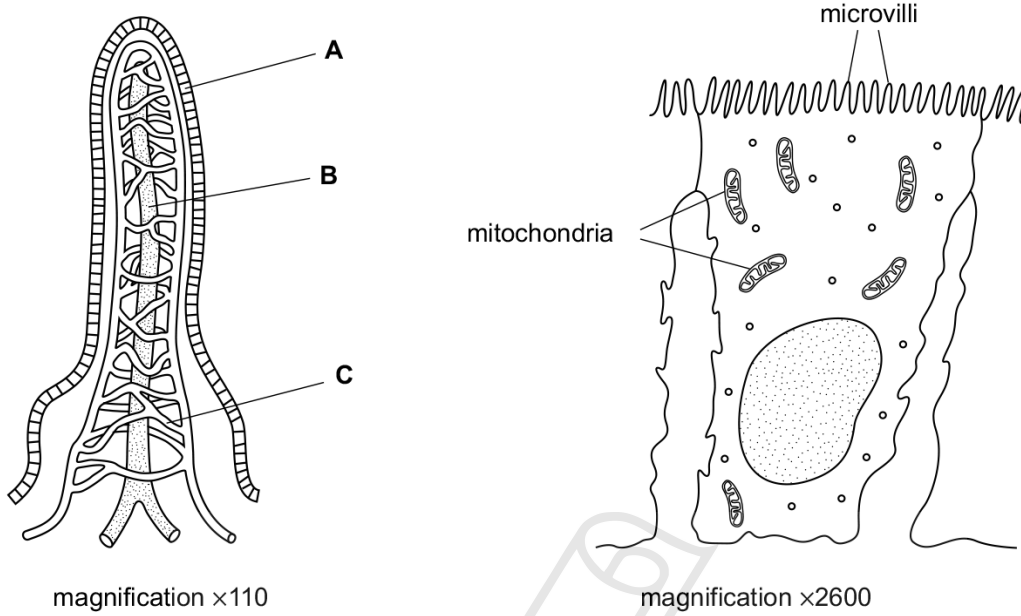


Fig. 6.1

(a) Name regions A, B and C.

- A
- B
- C [3]

(b) Explain why the cells from region A have many microvilli and many mitochondria.

-
-
-
-
-
-
- [3]

[Total: 6]

11. 0610_w19_qp_43 Q: 3

Carbohydrates are an important component of a balanced diet.

The flow chart in Fig. 3.1 shows some of the processes that happen to carbohydrates in food that is eaten.

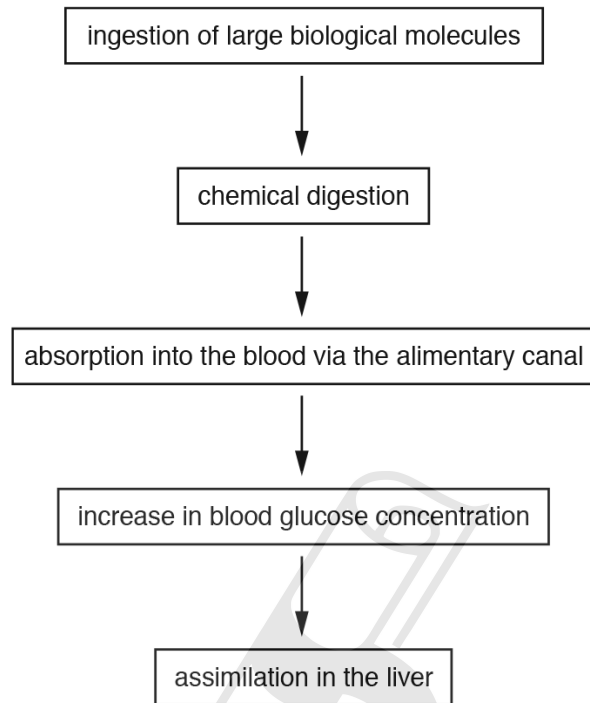


Fig. 3.1

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- (b) Mineral salts are another important component of a balanced diet.

State the importance of calcium ions and iron ions in a balanced diet.

calcium ions

.....

.....

iron ions

.....

.....

[4]

- (c) Consuming too much of some mineral salts, such as sodium chloride, increases the risk of developing coronary heart disease (CHD).

Doctors studied the effect of diet on the risk of developing CHD.

The doctors first selected volunteers who had a high salt diet.

The doctors assessed the volunteers' overall risk of developing CHD and monitored their blood pressure.

- (i) List **two** factors, **other than diet and blood pressure**, that the doctors considered when assessing the overall risk of the volunteers developing CHD.

1

2

[2]

- (ii) The doctors used urine tests to identify volunteers who had a high salt diet.

Explain why urine tests are a good indicator of how much salt has been consumed.

.....

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.....

.....

.....

..... [2]

(d) The volunteers were divided into two groups.

The mass of salt consumed by **both** groups was changed every 4 weeks:

- low salt intake for 4 weeks
- medium salt intake for 4 weeks
- high salt intake for 4 weeks.

In addition, group 2 was given other changes to their diet but group 1 was not.

(i) Suggest **one** component of the diet of group 2, **other than salt**, that the doctors changed to further reduce the risk of developing CHD.

..... [1]

The systolic blood pressure of the volunteers was measured every 4 weeks. These results are shown in Fig. 3.2.

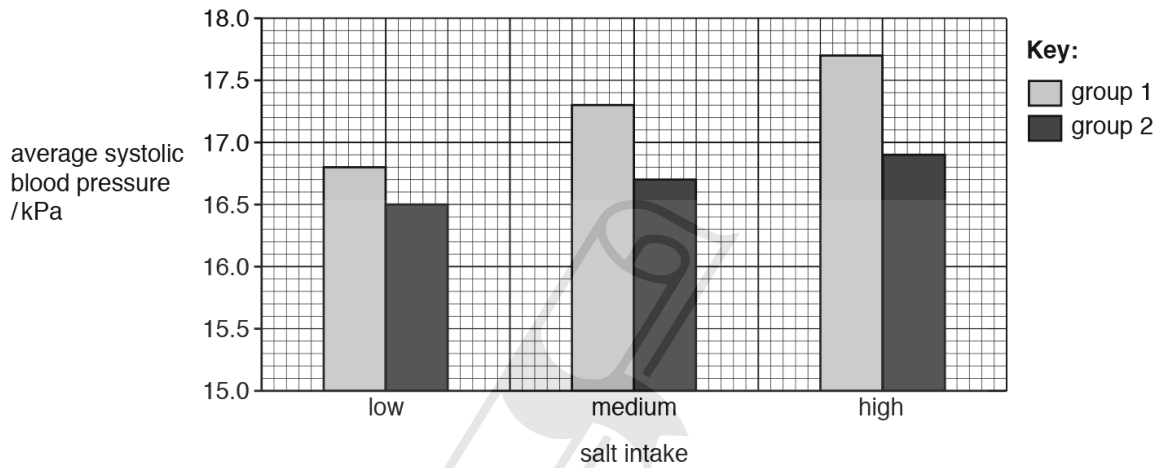


Fig. 3.2

(ii) Calculate the percentage increase in the average systolic blood pressure of the group 1 volunteers when they increased their salt intake from low to high.

low salt intake kPa

high salt intake kPa

Give your answer to the nearest whole number.

Space for working.

..... %
[3]

12. 0610_m17_qp_42 Q: 6

- (a) Table 6.1 shows some of the enzymes, their substrates, products and where they are produced in the digestive system.

Complete Table 6.1.

Table 6.1

enzyme	substrate	product(s)	location of enzyme production
.....	starch	.....	salivary glands
maltase	maltose	.....	.....
.....	.....	amino acids	stomach wall
.....	.....	amino acids	pancreas and small intestinal wall
lipase	fats	.....	.....

[5]

- (b) Bile is made in the liver, stored in the gall bladder and passes into the small intestine.

Describe the role of bile in digestion.

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[3]

- (c) After chemical digestion the products of digestion are absorbed.

Define *absorption*.

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[3]

(d) Lack of protein in the diet can result in protein-energy malnutrition.

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

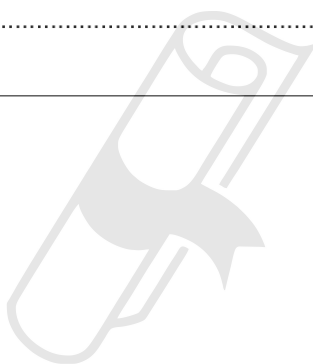
.....[1]

(e) 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.

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

[Total: 15]



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13. 0610_w17_qp_41 Q: 1

Fig. 1.1 and Fig. 1.2 show two images of villi.

Fig. 1.1 shows a surface view of many villi viewed through a scanning electron microscope.

Fig. 1.2 shows a section of one villus viewed through a light microscope.

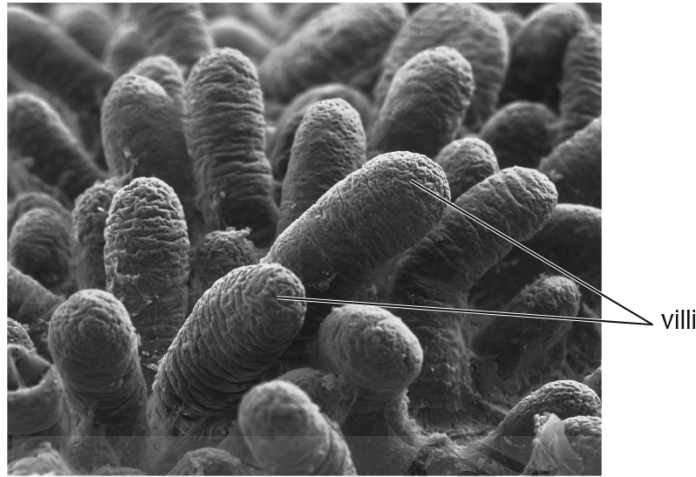


Fig. 1.1

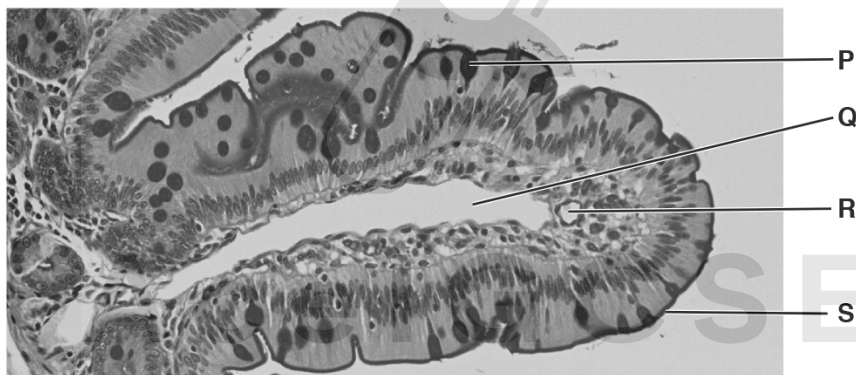


Fig. 1.2

(ii) The nutrients in the blood can be used to become part of cells.

State the name of this process.

.....[1]

(iii) Amino acids are an example of a type of nutrient transported in the blood.

State **two** examples of larger molecules found in cells that are made from amino acids.

1

2

[2]

[Total: 12]



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(i) State **two** ways in which the teeth of a tiger differ from the teeth of a rabbit, using evidence from Fig. 5.2.

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

(ii) Suggest **one** feature **visible** in Fig. 5.2 that indicates the tiger is a carnivore.

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



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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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.....[3]

- (e) Products of digestion are absorbed through the villi in the small intestine. Explain how villi are adapted for absorption.

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

- (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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.....
.....
.....[3]

[Total: 20]

Fig. 6.1 shows a villus from the small intestine of a mammal and an enlarged view of a cell from region A.

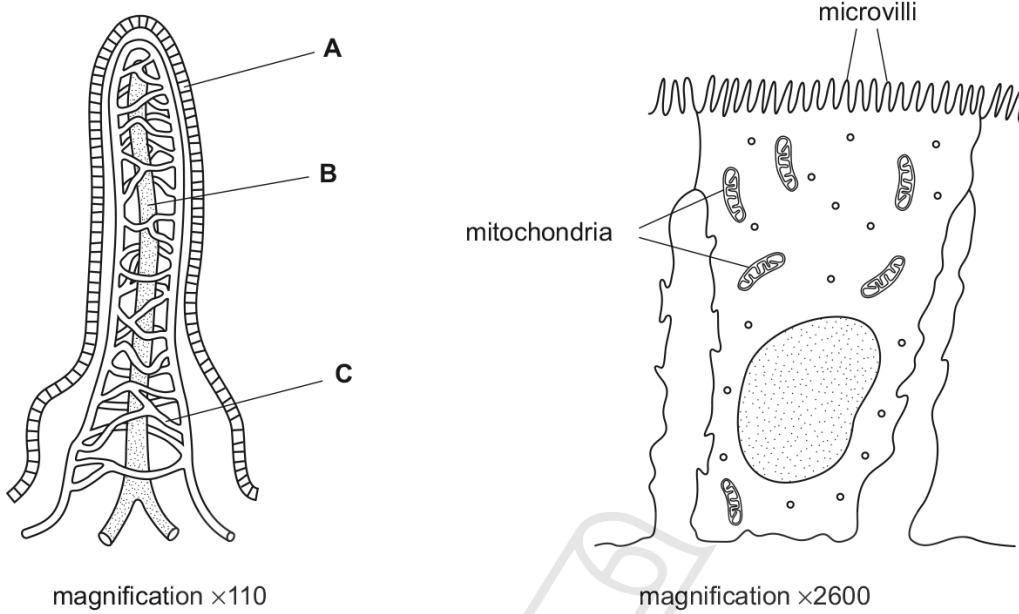


Fig. 6.1

(a) Name regions A, B and C.

- A
- B
- C [3]

(b) Explain why the cells from region A have many microvilli and many mitochondria.

-
-
-
-
-
- [3]

[Total: 6]

- (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]

01. 0610_m20_MS_42 Q: 4

	Answer	Mark	Partial Marks
(a)	<p><i>similarities, max 3 from:</i> both caused by protein (energy) deficiency ; both types of malnutrition / <u>deficiency disease</u> / caused by lack of a balanced diet ; primarily affects children ; diarrhoea ; low body mass / weight loss ; poor growth ; irritability / tiredness ; wastage of muscles ; dry skin / brittle nails ; brittle hair / change of hair colour ; fatty liver ; anaemia ; AVP ;</p> <p><i>differences:</i> kwashiorkor has water retention / oedema / swelling of body parts / pot belly ; people suffering marasmus also deficient in, carbohydrates / fats / calories / energy ; AVP ;</p>	4	
(b)(i)	18 (%) ;;;	3	MP1 selection of correct data i.e. 1419 and 1161 MP2 correct calculation MP3 correct rounding to whole number
(b)(ii)	any year between 1990 and 1994 or from 2000 onwards ; the number of children admitted to hospital decreases (after this year) ;	2	
(b)(iii)	<p>1 (described) hygienic food prep methods ; 2 washing hands / hand sanitisers ; 3 (description of use of) clean equipment ; 4 use of clean / boiled water / filtered water / pure water ; 5 (described examples of) disposal of waste correctly / <i>idea</i> of where defaecation occurs / defaecation in a toilet ; 6 monitor or identify infective individuals ; 7 isolate infected individuals ; 8 AVP ;</p>	3	

02. 0610_s16_MS_43 Q: 6

	Answer	Mark	Partial Marks
(a)	<p>V stomach ; W large intestine / colon / rectum ;</p>	[2]	I intestine unqualified
(b)	<p>breaks up food into small(er) pieces ; without chemical change ; by teeth / muscles ; to mix (with digestive juice) ; increases surface area ; for enzyme action ; speeds up <u>chemical</u> digestion ; easier to swallow ;</p>	[3]	<p>R molecules A without enzymes A mastication / chewing / churning</p> <p>A easier / more effective</p>
(c)	<p><i>for:</i> positive correlation / as (relative) body mass increases, time in digestive system increases ; any two or more figures from the graph ;</p> <p><i>against: max 3 from</i> two / one / few / some (species), are outliers / anomalies ; any figure(s) from the graph ;</p> <p>(description of) some mammals do not fit the, pattern / trend ; any example from the graph ;</p> <p>only information about 26 species of mammal / small sample size ; idea about unknown validity ;</p>	[max 4]	<p>units must be quoted at least once</p> <p>e.g. either outlier quoted</p>
		[Total: 9]	

03. 0610_s19_MS_43 Q: 6

	Answer	Mark	Partial Marks
(a)(i)	stores / contains, DNA / chromosomes / genes ; controls the cell ; AVP ;	1	
(a)(ii)	P – endoplasmic reticulum / (rough) ER / ribosome ; R – mitochondrion / mitochondria ;	2	
(b)	catalysts ; starch ; maltose / glucose ; pepsin ; liver ; neutralises ; <u>emulsification</u> ;	7	

04. 0610_m18_MS_42 Q: 6

	Answer	Mark	Partial Marks
(a)	breakdown of large to small <u>molecules</u> ; from insoluble to soluble ;	2	
(b)(i)	<i>test-tube 1</i> 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 ; <i>test-tube 2</i> 4 hydrochloric acid causes a low pH ; 5 pepsin works best in / optimal activity, low pH / acidic conditions ; <i>test-tube 3</i> 6 pepsin / enzyme, unable to break down, protein / egg white solution ; 7 boiling denatures, pepsin / enzyme ; 8 ref to enzyme-substrate complex / fewer successful collisions ; 9 high pH / boiling, changes shape of active site ;	5	
(b)(ii)	as a control ; to show that pepsin is responsible for the protein digestion ; to show that hydrochloric acid does not digest the protein ;	2	
(b)(iii)	stomach ;	1	
(c)	maltose broken down ; to <u>glucose</u> ; on the membranes of the epithelial lining ; (acts) in the small intestine / duodenum ;	3	

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05. 0610_s18_MS_41 Q: 1

	Answer	Mark	Partial Marks																								
(a)	A substrate ; B active site ; C enzyme-substrate complex ; D product(s) ;	4																									
(b)	production of, small(er) / soluble / simple(r), <u>molecules</u> ; (small molecules can be) absorbed / ref. to absorption ; ora (moves through) cell membranes / wall of intestine / into blood / into cells ;	2																									
(c)	<table border="1"> <thead> <tr> <th>function</th> <th>letter from Fig. 2.1</th> <th>name of structure</th> </tr> </thead> <tbody> <tr> <td>site of starch digestion</td> <td>A J / E</td> <td>mouth / buccal cavity small intestine</td> </tr> <tr> <td>reabsorption of water</td> <td>J / E H F</td> <td>small intestine colon / large intestine rectum</td> </tr> <tr> <td>secretion of pepsin</td> <td>C</td> <td>stomach</td> </tr> <tr> <td>site of maltose digestion</td> <td>J / E</td> <td>small intestine</td> </tr> <tr> <td>secretion of bile</td> <td>K L</td> <td>liver gall bladder</td> </tr> <tr> <td>storage of faeces</td> <td>F</td> <td>rectum</td> </tr> <tr> <td>secretion of lipase and trypsin</td> <td>D</td> <td>pancreas</td> </tr> </tbody> </table>	function	letter from Fig. 2.1	name of structure	site of starch digestion	A J / E	mouth / buccal cavity small intestine	reabsorption of water	J / E H F	small intestine colon / large intestine rectum	secretion of pepsin	C	stomach	site of maltose digestion	J / E	small intestine	secretion of bile	K L	liver gall bladder	storage of faeces	F	rectum	secretion of lipase and trypsin	D	pancreas	6	<p><i>one mark per row the letter must agree with the name if more than one letter or name mark first one only</i></p> <p>A J/E small intestine</p>
function	letter from Fig. 2.1	name of structure																									
site of starch digestion	A J / E	mouth / buccal cavity small intestine																									
reabsorption of water	J / E H F	small intestine colon / large intestine rectum																									
secretion of pepsin	C	stomach																									
site of maltose digestion	J / E	small intestine																									
secretion of bile	K L	liver gall bladder																									
storage of faeces	F	rectum																									
secretion of lipase and trypsin	D	pancreas																									

06. 0610_s18_MS_43 Q: 1

	Answer	Mark	Partial Marks																
(a)	(food) is broken down into smaller pieces (without chemical change) ; <i>sites of mechanical digestion:</i> mouth / buccal cavity (in context mechanical) ; stomach (in context of mechanical) ; chewing / mastication ; role of a named teeth ;; <i>ref to</i> involvement of tongue ; <i>ref to</i> movement of the jaw ; churning / muscular, action of the stomach ;	4																	
(b)	<table border="1"> <thead> <tr> <th>part of the alimentary canal</th> <th>enzyme</th> <th>substrate</th> <th>product(s)</th> </tr> </thead> <tbody> <tr> <td>mouth</td> <td>amylase</td> <td>starch</td> <td>maltose</td> </tr> <tr> <td>stomach</td> <td>pepsin</td> <td>protein</td> <td>peptides</td> </tr> <tr> <td>small intestine / duodenum / ileum</td> <td>lipase</td> <td>fat</td> <td>fatty acids and glycerol</td> </tr> </tbody> </table>	part of the alimentary canal	enzyme	substrate	product(s)	mouth	amylase	starch	maltose	stomach	pepsin	protein	peptides	small intestine / duodenum / ileum	lipase	fat	fatty acids and glycerol	3	<p><i>one mark per row</i></p> <p>A protease (for enzyme)</p> <p>R pancreas (for part of the alimentary canal)</p>
part of the alimentary canal	enzyme	substrate	product(s)																
mouth	amylase	starch	maltose																
stomach	pepsin	protein	peptides																
small intestine / duodenum / ileum	lipase	fat	fatty acids and glycerol																
(c)(i)	<u>glycogen</u> ;	1																	
(c)(ii)	<u>antibody</u> ;	1																	
(c)(iii)	(thermal) insulation ;	1	A storage / protection																

07. 0610_s17_MS_42 Q: 4

	Answer	Mark	Partial Marks
(a)	<ol style="list-style-type: none"> 1 all, nutrients / components ; 2 nutrients in correct, proportions / amounts ; 3 at least three named 'components' ; 4 to maintain health ; 5 appropriate energy requirements / AW ; 6 different requirements according to, age / sex / lifestyle / pregnancy ; 	3	A prevent (named) deficiencies
(b)	<ol style="list-style-type: none"> 1 lack of growth / low body weight / weight loss ; 2 (described) effect on, hair / skin / nails ; 3 diarrhoea / vomiting ; 4 fatigue ; 5 muscle wasting ; 6 (more) prone to, infections / disease ; 	3	A dehydration A irritable / dizzy / weak / AW A muscle weakness A wounds heal slowly
(c)	<p><i>description</i></p> <ol style="list-style-type: none"> 1 marasmus child lower mass than healthy child, initially / AW ; 2 initial (rapid) increase in mass of child with marasmus ; 3 then trend almost follows increase of healthy children ; 4 later / AW, marasmus child is similar to / heavier than, healthy child ; 5 comparative data in children's mass with units stated at least once ; 6&7&8 comparative data of milk with units stated at least once ;; <p><i>explanation</i></p> <ol style="list-style-type: none"> 9 protein required for, new cells / muscle / repair ; 10 carbohydrates / fats, required for, energy / respiration ; 11 fats required for, insulation / cell membranes / protecting organs / neurones ; 12 treatment for marasmus / AW, has more, (named) nutrients / energy ; 13 marasmus child encouraged to drink as much as possible ; 14 nutrients are required (for children) for, growth ; 	6	MP 4 A masses of both children crossover / are the same at 16.6 months MP 4 A any stated time after 16.5 months
(d)	<ol style="list-style-type: none"> 1 emulsification ; 2 increased surface area of fats ; 3 for lipase ; 4 neutralises (stomach) acid / chyme / provide suitable pH (for lipase) ; 5 speeds up digestion (of fats) ; 	3	A description A makes chyme alkaline / AW

08. 0610_w16_MS_41 Q: 3

	Answer	Mark	Partial Marks
(a)(i)	amino acids;	1	
(a)(ii)	stomach;	1	
(b)(i)	ref. to surface area; affecting enzyme / enzyme activity; allows comparison; make experiment valid; controlled variable;	2	
(b)(ii)	water-bath / in a beaker of water / incubator; insulate test-tube; allow solutions to equilibrate to temperature (before experiment); use a thermometer to check the temperature (is constant);	2	
(c)	(pH) 8 ± 1 ;	1	
(d)	enzymes are protein; enzymes can be reused / are unchanged in the reaction; enzymes are specific; (enzymes are) catalysts / speeds up reaction; lowers the energy needed for the reaction; successful collisions / enzyme-substrate complex / ESC; active site; (enzyme and substrate) fit together; complementary shape; (digestive enzymes perform) chemical digestion / hydrolysis / catabolic reactions; break down, large / insoluble, molecules into, small / soluble, molecules; amylase converts starch to sugars / maltose; lipase converts lipid / fats, to fatty acids and glycerol; maltase converts maltose to simple sugars / glucose; ref to pH; ref to denaturation;	6	
		Total: 13	

09. 0610_w16_MS_42 Q: 1

	Answer	Mark	Partial Marks
(a)	<p><i>protein to max 1</i> for growth/making new cells/repair/replacement (of tissues)/making (named) tissue; provides amino acids (for making protein);</p> <p><i>lactose</i> (provides) energy/(glucose for) respiration;</p> <p><i>calcium to max 1</i> (strengthening) bones/teeth; needed for vitamin D to function; blood clotting; for muscle contraction; for nerve impulse conduction;</p>	3	<p>R 'produces energy'</p> <p>I ref. to deficiency diseases—not a role</p>
(b)	<p>1 enzymes are, biological/protein, catalysts/speed up reactions;</p> <p>2 ref to <u>specificity</u>;</p> <p>3 <u>active site</u>;</p> <p>4 substrate/protein, fits into/AW, enzyme/active site;</p> <p>5 ref to, complementary shape of molecules;</p> <p>6 enzyme-substrate complex/ESC;</p> <p>7 enzymes, lower energy needed for reaction;</p> <p>8 enzymes are, unchanged (at end of reaction)/reused;</p> <p>9 (enzymes) carry out, chemical digestion/hydrolysis/catabolic reactions;</p> <p>10 break down, large/insoluble, molecules into, small(er)/soluble, molecules;</p> <p>11 protein broken down to, polypeptides/peptides/amino acids;</p> <p>12 pepsin, active in stomach;</p> <p>13 trypsin, active in, small intestine/duodenum/ileum;</p> <p><i>ref. to conditions in alimentary canal</i></p> <p>14 low pH/pH 1–3/(hydrochloric) acid, in stomach;</p> <p>15 high pH/alkaline/neutral/non-acidic/pH 7–9, in, small intestine/duodenum/ileum;</p> <p>16 ref. to denaturation;</p> <p>17 temperature is 37 °C;</p> <p>18 ref. to successful collisions;</p>	6	<p>A lower activation energy</p> <p>A gastric juice I rennin</p> <p>A ± 1 °C</p>
(c)(i)	no enzyme to, digest/break down, lactose; lactose (molecule) is (too) large/complex; cannot pass through, (cell) membrane(s); no carrier protein for it ;	2	<p>A no <u>lactase</u> / not enough enzyme</p> <p>A not broken down to small(er) molecules</p>
(c)(ii)	<p>1 dehydration/loss of water;</p> <p>2 loss of, (named) salt(s)/ions/minerals/vitamins;</p> <p>3 decrease in, volume of blood/blood pressure;</p> <p>4 increase in blood concentration/decrease in water potential;</p> <p>5 any effect on cells ;</p> <p>6 AVP; e.g. less efficient reactions/slower metabolism/kidney failure/ref to effect on brain cells/coma/death</p>	3	<p>I fatigue/weakness/weight loss/headache/deficiency disease/dizziness/AW</p> <p>A loss/poor absorption, of nutrients/malnutrition I 'food'</p> <p>A volume of plasma</p> <p>e.g. cell shrinkage/loss of water from cells by osmosis</p> <p>mp6 A <i>idea that</i> less water as a <u>solvent</u> R no solvent</p>
(d)(i)	control; for comparison (with different treatments)/to see if there is any difference between effects of treated milk and untreated milk;	2	I 'fair test'
(d)(ii)	(lactase) digests/breaks down, lactose; molecules, are small enough to be absorbed/do not pass straight through, small intestine/AW; reduces chance of diarrhoea/means lactose intolerant people can consume milk/AW;	2	
(d)(iii)	(concentration/amount of) hydrogen is the lowest/least; ora concentration/amount, of hydrogen, shows small, fluctuations/changes/AW; (concentration/amount) not higher than 15 (±1) ppm/between 9–15 (±1) <u>ppm</u> ; comparative data quote between D and A, B or C;	3	<p><i>units—h and ppm must be used at least once if no units then don't award MP3 and MP4</i></p> <p>mp1 must be comparative</p>
		Total: 21	

10. 0610_p20_MS_40 Q: 6

- (a) **A** epithelium / epithelial lining;
- B** lacteal;
- C** capillary / blood vessel;

[3]

(b) Any three from:

microvilli

increases / large surface area;

for absorption;

allow: diffusion / active transport (into villus)

mitochondria

(for) respiration;

provide energy / ATP;

for active uptake / transport;

[max 3]



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11. 0610_w19_MS_43 Q: 3

	Answer	Mark	Partial Marks
(a)	<p>1 ingestion / digestion / described, occurs in mouth ; 2 chemical digestion / absorption / described, occurs in <u>small</u> intestine / duodenum / ileum ;</p> <p><i>ingestion of large biological molecules</i> 3 mechanical / physical, digestion / breaking, carbohydrate / food, into small pieces ; 4 <i>ref to</i> chew / grind / bite / by teeth / tongue / swallow / moves through oesophagus / churned in stomach ;</p> <p><i>chemical digestion</i> 5 breakdown <u>insoluble</u> molecules into (smaller) <u>soluble</u> molecules ; 6 salivary (glands) / pancreas, secrete amylase ; 7 amylase breaks down, <u>starch</u>, to, maltose / glucose / sugar ; 8 maltase is on <u>epithelium</u> of the, small intestine / duodenum / ileum ; 9 maltase breaks down maltose to <u>glucose</u> ; 10 bile neutralizes (stomach) acid ; 11 <i>ref to</i> neutral / 7 / 8 pH for, amylase / maltase ;</p> <p><i>absorption into the blood via the alimentary canal</i> 12 by <u>diffusion</u> / <u>active transport</u>, into villi / microvilli / capillaries ; 13 microvilli / villi / folds, increase the surface area (for absorption) ;</p> <p><i>increased blood glucose concentration</i> 14 <u>insulin</u>, secreted / produced / AW, from pancreas ; 15 <u>insulin</u> reduces blood glucose concentration ; 16 <i>ref to</i> negative feedback / homeostasis / described ;</p>	8	
(a)	<p><i>assimilation in the liver</i> 17 glucose, stored as / converted to, <u>glycogen</u> (in liver) ; 18 (assimilated) into, cell / tissues to become part of cell / <i>ref. to</i> respiration / for release of energy ;</p>		
(b)	<p><i>calcium ion:</i> for (the formation / maintenance, of healthy / strong) bones ; for (the formation / maintenance, of healthy / strong) teeth ; AVP ;;</p> <p><i>iron ions:</i> found in / AW, haemoglobin (molecule) / red blood cell ; transport oxygen ; prevent <u>anaemia</u> ;</p>	4	
(c)(i)	<p>stress ; smoking ; genetic predisposition / family history ; age ; sex ; activity level / AW ; any pre-existing medical conditions / AW ; alcohol / drug / medication ; obesity / weight / mass / BMI / AW ;</p>	2	
(c)(ii)	<p>(excess) salt is, <u>excreted</u> / removed from body (in urine) ; some salt is (re)absorbed in the, kidney / tubules / into the blood ; people are not reliable in recording / remembering / measuring how much salt they eat ;</p>	2	
(d)(i)	<p>(reduce) fat / cholesterol ; (increase) fibre / roughage ; (increase) water ;</p>	1	
(d)(ii)	<p>low = 16.8 (kPa) and high = 17.7 (kPa) ; 5(%) ;;</p>	3	
(d)(iii)	<p>low salt diets reduce (systolic) blood pressure / risk of CHD ; ora modified diets / group 2, reduce (systolic) blood pressure / risk of CHD ; ora any description of an interaction between the salt diet <u>and</u> modified diets together affecting the, blood pressure / risk of CHD ; comparative data quote with units ;</p>	3	

Answer					Mark	Partial Marks
(a)	enzyme	substrate	product/s	location of enzyme production	5	<p>A polypeptides for protein</p> <p>A peptides for protein</p>
	(salivary) amylase	starch	maltose	salivary glands ;		
	maltase	maltose	glucose	small intestinal wall ;		
	<u>pepsin</u>	protein	amino acids	stomach (wall) ;		
	<u>trypsin</u>	protein	amino acids	small intestinal (wall) ;		
	lipase	fats	fatty acids and glycerol	pancreas / small intestinal wall ;		
(b)	<p><u>emulsification</u> ; increased surface area of fat globules ; faster, digestion / break down of fat by enzymes ; by lipase / to fatty acids <u>and</u> glycerol ; neutralises (stomach) acid ;</p>				3	
(c)	<p>the movement of small food molecules and ions ; through the <u>wall</u> of the intestine ; into the blood ;</p>				3	
(d)	<p>marasmus / kwashiorkor ;</p>				1	
(e)	<p>reduces, calorie / energy intake ; reduces obesity ; reduces chances of CHD ; AVP ;;</p>				3	

13. 0610_w17_MS_41 Q: 1

	Answer	Mark	Partial Marks
(a)(i)	absorption (of digested food / water) / movement of (small) molecules (from small intestine) into blood ;	1	
(b)	1 goblet cells labelled P ; 2 shaped described / produces mucus ; 3 lacteal / lymph vessel / lymphatic vessel, labelled Q ; 4 description / transports fatty acids / fats; 5 capillaries / blood vessel, labelled R ; 6 thin / one cell thick, walls / carries products of digestion ; 7 microvilli / epithelia labelled S ; 8 for <i>microvilli</i> accept – large surface area / thin, for diffusion / absorption ;	4	
(c)(i)	watery faeces / AW ; dehydration / described ; loss of, salts / ions / electrolytes ; cramps / stomach pain ; death ;	2	A water not absorbed from faeces I nutrients
(c)(ii)	oral rehydration therapy ;	1	A antibiotics
(d)(i)	(blood) plasma ;	1	
(d)(ii)	assimilation ;	1	
(d)(iii)	protein ; named proteins ;;	2	A (poly)peptides e.g. (named) enzymes, antibodies, insulin, fibrinogen, haemoglobin, glucagon I hormones

14. 0610_m16_MS_42 Q: 5

	Answer	Mark	Partial Marks
(a)	<p><i>canine</i> piercing/tearing the food ;</p> <p><i>molar</i> chewing /grinding the food ;</p>	[2]	<p>A ripping /pulling I cutting /biting</p>
(b) (i)	<p>1 tiger has more pointed incisors /rabbit has less pointed incisors ; 2 tiger has canines /rabbit has no canines ; 3 tiger has jagged, premolars / molars ; 4 tiger has fewer molars /rabbits have more molars ; 5 rabbit has a diastema / (larger) gap between incisors and pre molars ;</p>	[max 2]	<p>mpt 1 I flat mpt 1 A chisel /wedge- shaped mpt 2 I tiger has more canines mpt 3 A rabbits have flat, premolar / molars A tigers have no, diastema /smaller gap between incisors and pre molars I ref to size (photo are not to scale)</p>
(ii)	<p>canines ; jagged, premolars / molars ; eyes positioned at the front of the skull ; pointed ridge / crest, on skull ;</p>	[1]	<p>I ref to incisors A carnassial / sharp for jagged I ref to absence of diastema</p>
(c) (i)	<p>12/44 × 100 27 ;;</p>	[2]	
(ii)	<p><i>arguments for carnivore:</i> 1 has same number of incisors as, other carnivores /5/6 ; 2 has same number of canines as, other carnivores 5/6 ; 3 has same number of molars as, 6/a carnivore ;</p> <p><i>arguments against carnivore:</i> 4 same number of premolars as, herbivores /3/4; 5 1/2/3/some herbivores/omnivores, also have 12 incisors ; 6 1/2/3/some herbivores/omnivores, also have 4 canines ;</p>	[max 4]	
(d)	<p>1 denatures enzymes in microorganisms ; 2 kills, microorganisms / (named) pathogens ; 3 optimum pH for <u>pepsin</u> activity ; 4 proteins are digested /broken down, to (poly)peptides / amino acids ;</p>	[max 3]	<p>R kills enzymes R denatures</p>
(e)	<p>1 villi lining /epithelium, only one cell thick /thin ; 2 good blood supply /many capillaries ; 3 <u>microvilli</u> ; 4 large surface area ; 5 lacteal for fats /fatty acid, absorption ; 6 protein channels ; 7 mitochondria for active transport ;</p>	[max 3]	<p>I villi is 1 cell thick</p>
(f)	<p>1 weight loss /poor growth /lack of energy /stomach pain /abdominal pain / cramps /diarrhoea /weaker immune system ; 2 <u>malnutrition</u> /<u>deficiency disease</u> ;</p> <p>3,4 named, nutrient deficiency /effect, with deficient nutrient ;;; &5 e.g. anaemia → iron / vitamin B12 kwashiorkor → protein ; marasmus → all nutrients scurvy → vitamin C night blindness → vitamin A /retinol</p>	[max 3]	<p>I weak /sluggish</p>
		[Total: 20]	

15. 0610_p16_MS_40 Q: 6

- (a) **A** epithelium / epithelial lining;
B lacteal;
C capillary / blood vessel;

[3]

- (b) Any three from:

microvilli

increases / large surface area;

for absorption;

allow: diffusion / active transport (into villus)

mitochondria

(for) respiration;

provide energy / ATP;

for active uptake / transport;

[max 3]

16. 0610_w16_MS_43 Q: 3

	Answer	Mark	Partial Marks
(a)	human / largest mammal, has the longest / bat has the shortest (small intestine); (small intestine of) rat and cat are very similar in length; comparative data, quote / calculation with units at least once; negative correlation between length and length relative to body mass;	3	A relative to body mass bat much larger than other three animals / smallest length relative to body mass is in humans
(b)	movement into / out of / through, (epithelial) cells / villi; into, capillaries; across cell membranes; by active transport; through protein carriers; against a concentration gradient; using energy;	3	I walls I into blood
(c)(i)	(insect-eating) bat;	1	
(c)(ii)	ratios are higher in the duodenum; higher (inner) surface area (than ileum); data comparison (for any one animal); more villi; more microvilli;	3	
(d)	emulsification; increased surface area of fat (globules); faster, digestion / break down (of fat by enzymes); by lipase / to fatty acids and glycerol; neutralises (stomach) acid / chyme; provides alkaline medium for, pancreatic enzymes / lipase; denatures, pepsin / stomach, enzymes; AVP;	4	I faster break down of fats unqualified
		Total: 14	