

## 2: Animal nutrition – Topic questions

## Paper 4

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
1	2016	November	42
3	2016	November	43
6	2016	June	43

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at [www.cambridgeinternational.org/support](http://www.cambridgeinternational.org/support)

- (a)** Table 1.1 shows three nutrients that are contained in milk.

### Table 1.1

nutrient	role in the body
protein	
lactose (milk sugar)	
calcium	

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

[6]

- (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.

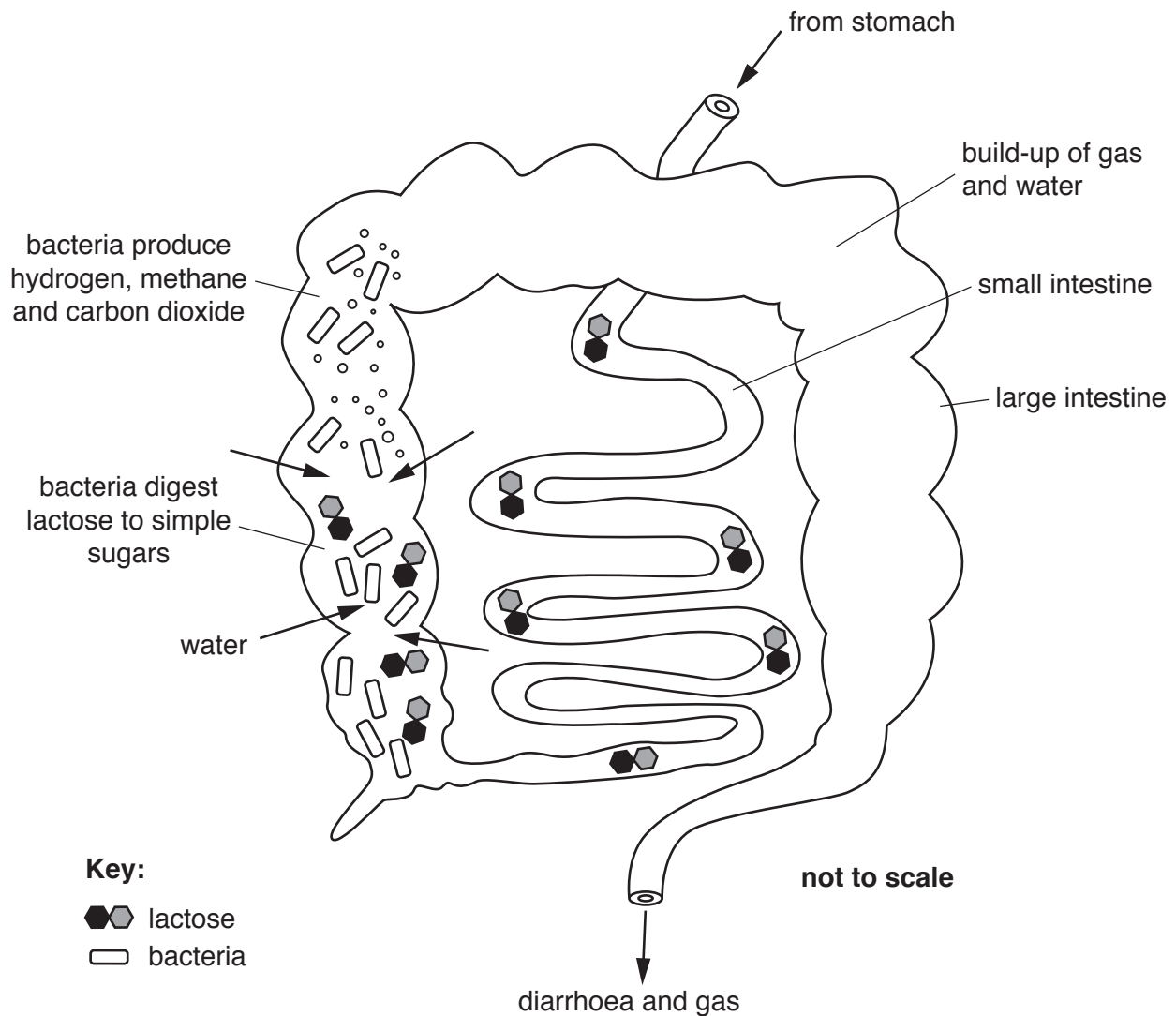


Fig. 1.1

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

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..... [2]

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

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(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.

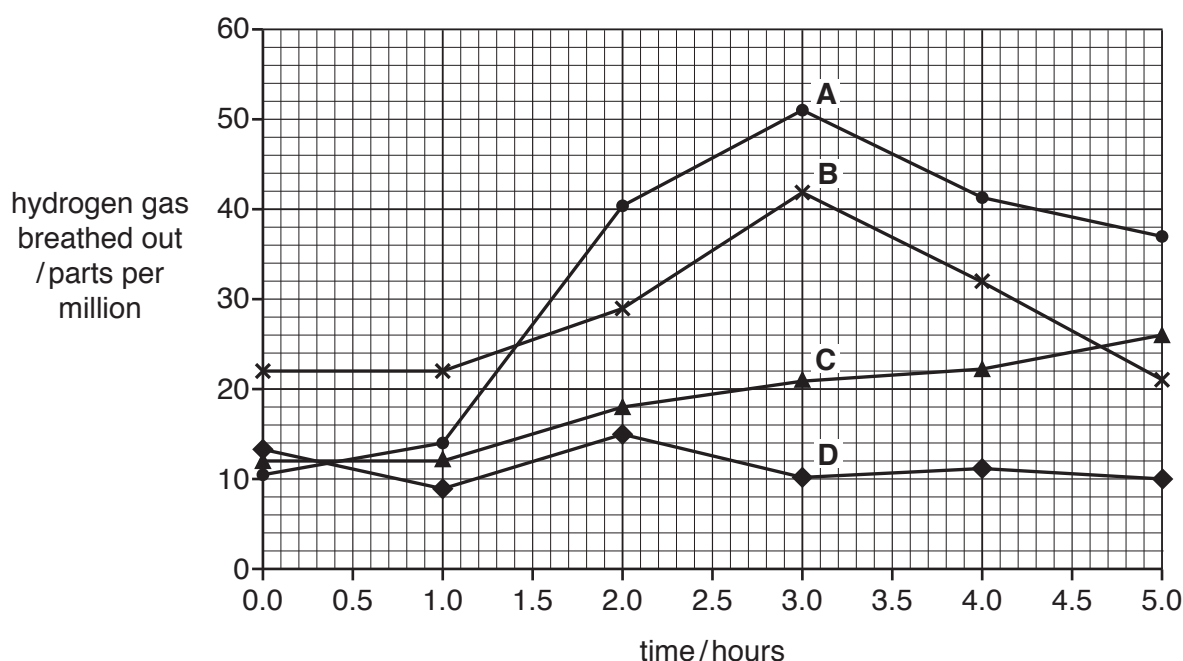


Fig. 1.2

(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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(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]

**[Total: 21]**

- 3** 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.

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.....[3]

A diagram of a blood vessel, showing a cross-section at the right end. The vessel is a tube with a wavy inner lining. Labels with leader lines point to the 'outer surface' (the outer wall), the 'inner surface' (the wavy lining), and the 'lumen' (the central opening).

A function of the small intestine is absorption.

.....[3]

- (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.

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

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

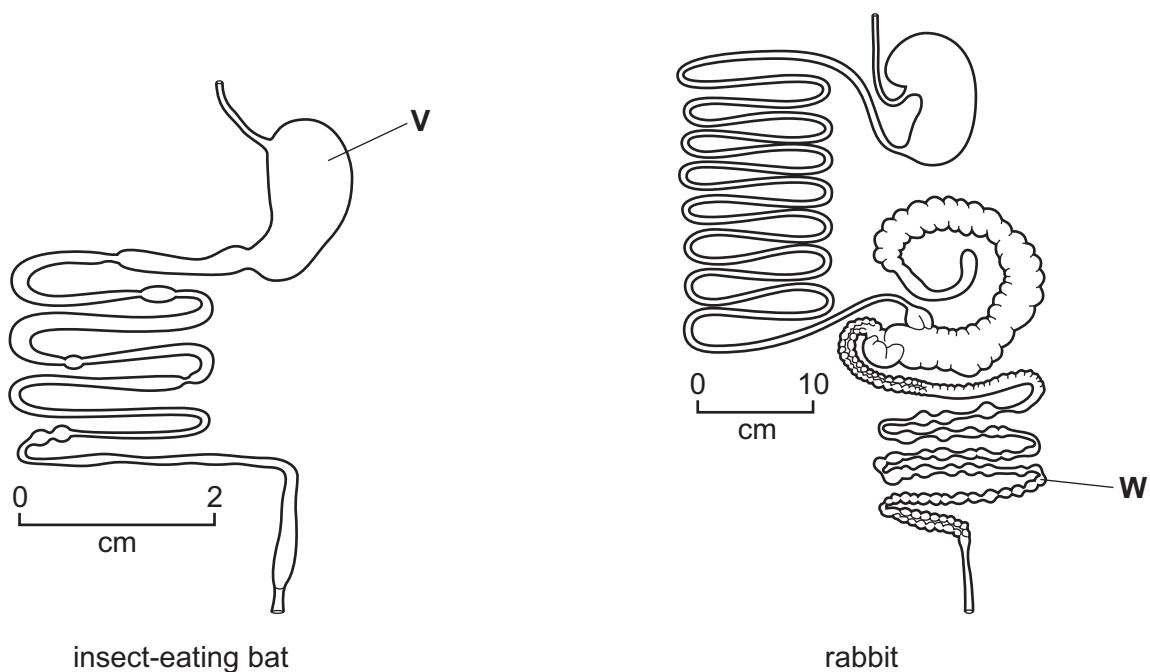
Outline the roles of bile.

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**[Total: 14]**



- 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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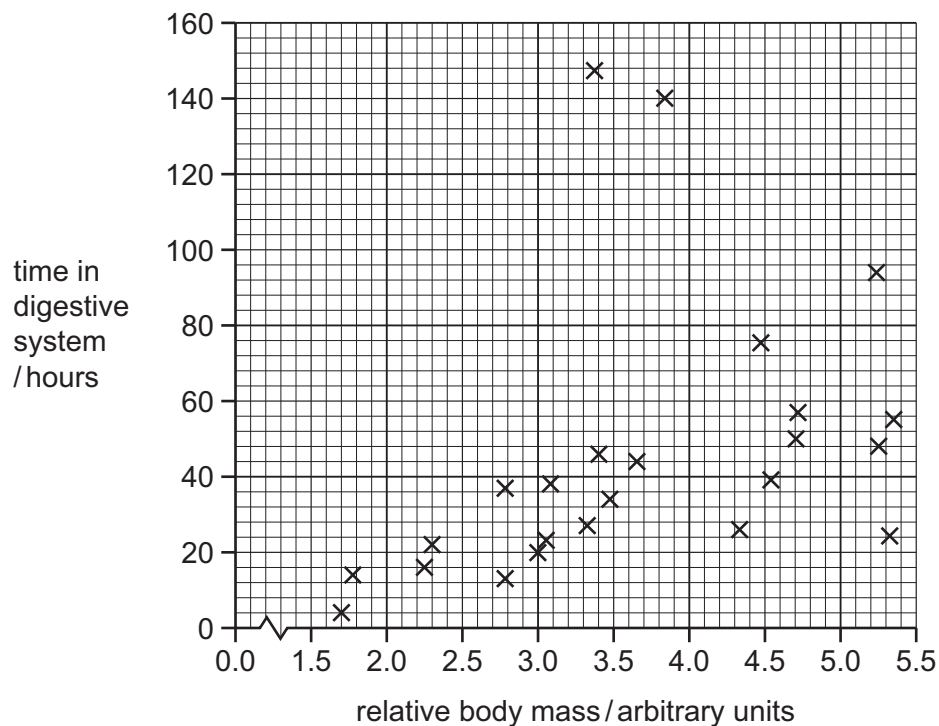
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[3]

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**

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

Discuss the evidence from Fig. 6.2 for **and** against the statement that food stays longer in the digestive systems of larger mammals.

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..... [4]

[Total: 9]

### Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
AVP	any valid point
ecf	credit a correct statement / calculation that follows a previous wrong response
ora	or reverse argument
( )	the word / phrase in brackets is not required, but sets the context
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
1 (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);  <i>lactose</i>  (provides) energy / (glucose for) respiration;  <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]

Question	Answer	Marks
1 (b)	1 enzymes are, biological / protein, catalysts / speed up reactions; 2 ref to specificity; 3 active site; 4 substrate / protein, fits into / AW, enzyme / active site; 5 ref to, complementary shape of molecules; 6 enzyme-substrate complex / ESC; 7 enzymes, lower energy needed for reaction; 8 enzymes are, unchanged (at end of reaction) / reused; 9 (enzymes) carry out, chemical digestion / hydrolysis / catabolic reactions; 10 break down, large / insoluble, molecules into, small(er) / soluble, molecules; 11 protein broken down to, polypeptides / peptides / amino acids; 12 pepsin, active in stomach; 13 trypsin, active in, small intestine / duodenum / ileum; <i>ref. to conditions in alimentary canal</i> 14 low pH / pH 1–3 / (hydrochloric) acid, in stomach; 15 high pH / alkaline / neutral / non-acidic / pH 7–9, in, small intestine / duodenum / ileum; 16 ref. to denaturation; 17 temperature is 37 °C; 18 ref. to successful collisions;	[6]
1 (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]
1 (c) (ii)	1 dehydration / loss of water; 2 loss of, (named) salt(s) / ions / minerals / vitamins; 3 decrease in, volume of blood / blood pressure; 4 increase in blood concentration / decrease in water potential; 5 any effect on cells ; 6 AVP; e.g. less efficient reactions / slower metabolism / kidney failure / ref to effect on brain cells / coma / death	[3]
1 (d) (i)	control; for comparison (with different treatments) / to see if there is any difference between effects of treated milk and untreated milk;	[2]
1 (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]
1 (d) (iii)	(concentration / amount of) hydrogen is the lowest / least; <b>ora</b> concentration / amount, of hydrogen, shows small, fluctuations / changes / AW; (concentration / amount) not higher than 15 ( $\pm 1$ ) ppm / between 9 – 15 ( $\pm 1$ ) ppm; comparative data quote between D and A, B or C;	[3]
[Total: 21]		

Question	Answer	Marks
3 (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]
3 (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]
3 (c) (i)	(insect-eating) bat	[1]
3 (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]
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]
<b>[Total: 14]</b>		
6 (a)	<b>V</b> stomach ; <b>W</b> large intestine / colon / rectum ;	[2]
6 (b)	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 chemical digestion ; easier to swallow ;	[3]
6 (c)	for: positive correlation / as (relative) body mass increases, time in digestive system increases ; any two or more figures from the graph ; against: max 3 from two / one / few / some (species), are outliers / anomalies ; any figure(s) from the graph ; (description of) some mammals do not fit the, pattern / trend ; any example from the graph ; only information about 26 species of mammal / small sample size ; idea about unknown validity ;	[max 4]
<b>[Total: 9]</b>		