

1 (a) (i) Explain the term *balanced diet*.

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..... [3]

(ii) State **three** factors that influence a person's nutritional needs.

1 .....  
2 .....  
3 ..... [3]

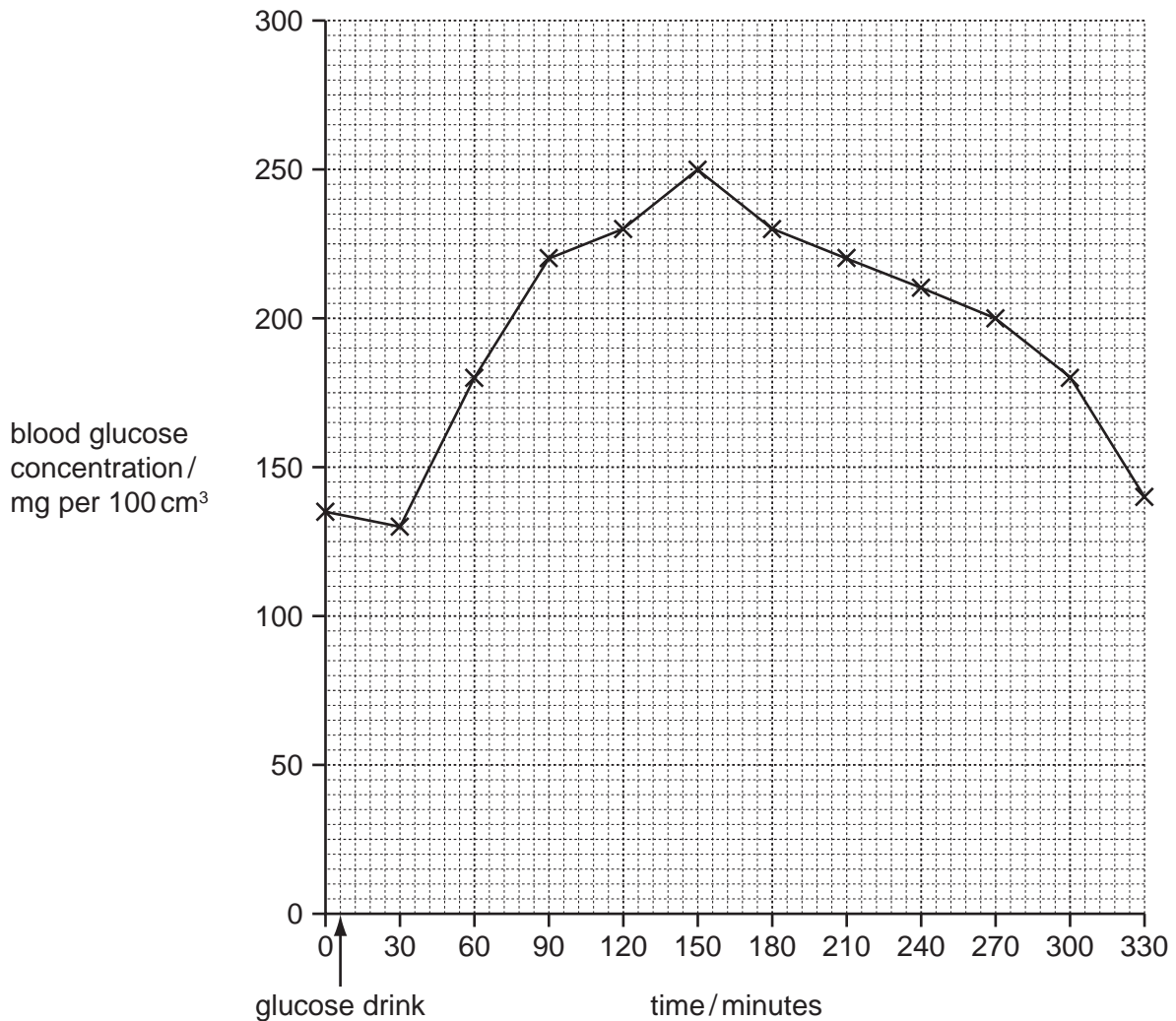
(b) Glucose is absorbed in the small intestine and transported in the blood. The kidneys filter the blood and reabsorb the glucose.

If the blood contains more than 180 mg of glucose per 100 cm<sup>3</sup>, the kidney cannot reabsorb it all and some is present in the urine. This figure is called the **renal threshold**.

A doctor suspects that a patient has diabetes because a urine test is positive for glucose.

The patient takes a glucose tolerance test by drinking a solution of glucose. The doctor records the patient's blood glucose concentration at 30 minute intervals for five and a half hours.

The results are plotted on Fig. 2.1.



**Fig. 2.1**

- (i) Draw a horizontal line on Fig. 2.1 to show the **renal threshold**. [1]
- (ii) State the time period when the kidney will produce urine containing glucose. [1]  
.....
- (iii) Sketch on Fig. 2.1 the blood glucose concentrations that the doctor might expect if he repeated this test on someone who does **not** have diabetes. [1]

(c) People who do not have diabetes maintain their blood glucose concentration below 180 mg per 100 cm<sup>3</sup>.

Explain how the body does this.

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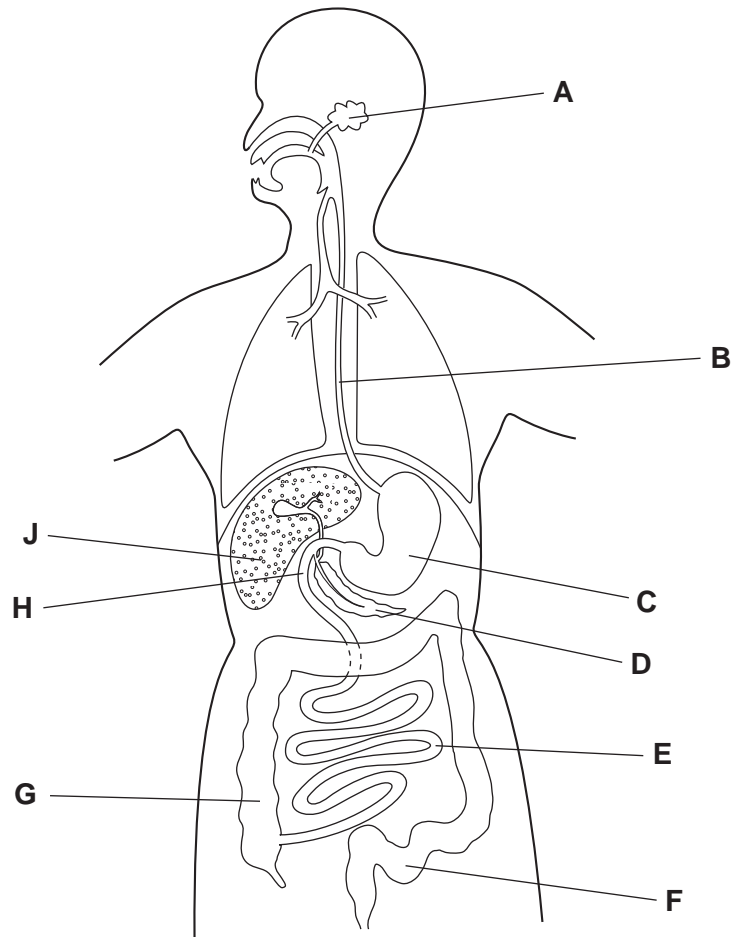
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..... [3]

**[Total: 12]**

2 (a) Fig. 1.1 is a diagram of the human digestive system.



**Fig. 1.1**

Use the letters from Fig. 1.1 to complete Table 1.1 to give the part of the human digestive system that is identified by each function.

Write one letter only in each box. You may use the same letter more than once. There are some letters that you will not use. The first one has been done for you.

**Table 1.1**

function	
peristalsis	<b>B</b>
protein digestion	
insulin production	
deamination	
partially digested food is mixed with bile	
most water is reabsorbed	

The human diet provides nutrients for the synthesis of biological molecules that make up cells, cell products and tissues.

- (b) (i)** Complete Table 1.2 to show the nutrients that are absorbed from food to synthesise the large molecules listed.

**Table 1.2**

large molecules	nutrients absorbed
protein	
glycogen	
fat	

[3]

- (ii)** Mineral ions are required in the human diet in small quantities.

State the mineral ion required for each process:

making bone .....

making haemoglobin. .... [2]

- (iii)** State another type of nutrient required in the human diet in small quantities.

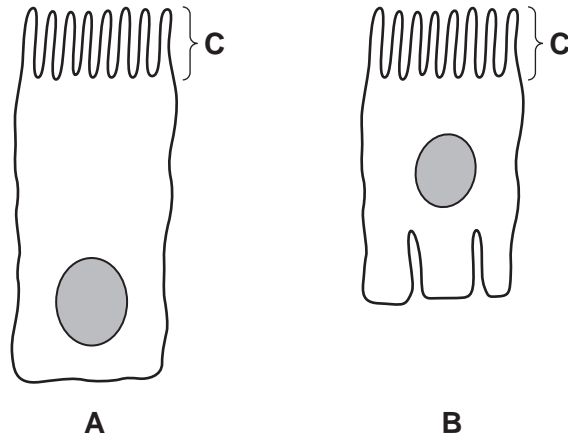
..... [1]



3 Fig. 1.1 **A** shows a cell from the lining of the alimentary canal.

Fig. 1.1 **B** shows a cell from the lining of a kidney tubule.

Both cells absorb substances into the blood.



**Fig. 1.1**

(a) Name the structures labelled **C** on the cells in Fig. 1.1.

..... [1]

(b) List three substances that are absorbed by **both** cells shown in Fig. 1.1.

- 1 .....
- 2 .....
- 3 ..... [3]

(c) Explain how **both** cells shown in Fig. 1.1 are adapted for absorption of substances into the blood.

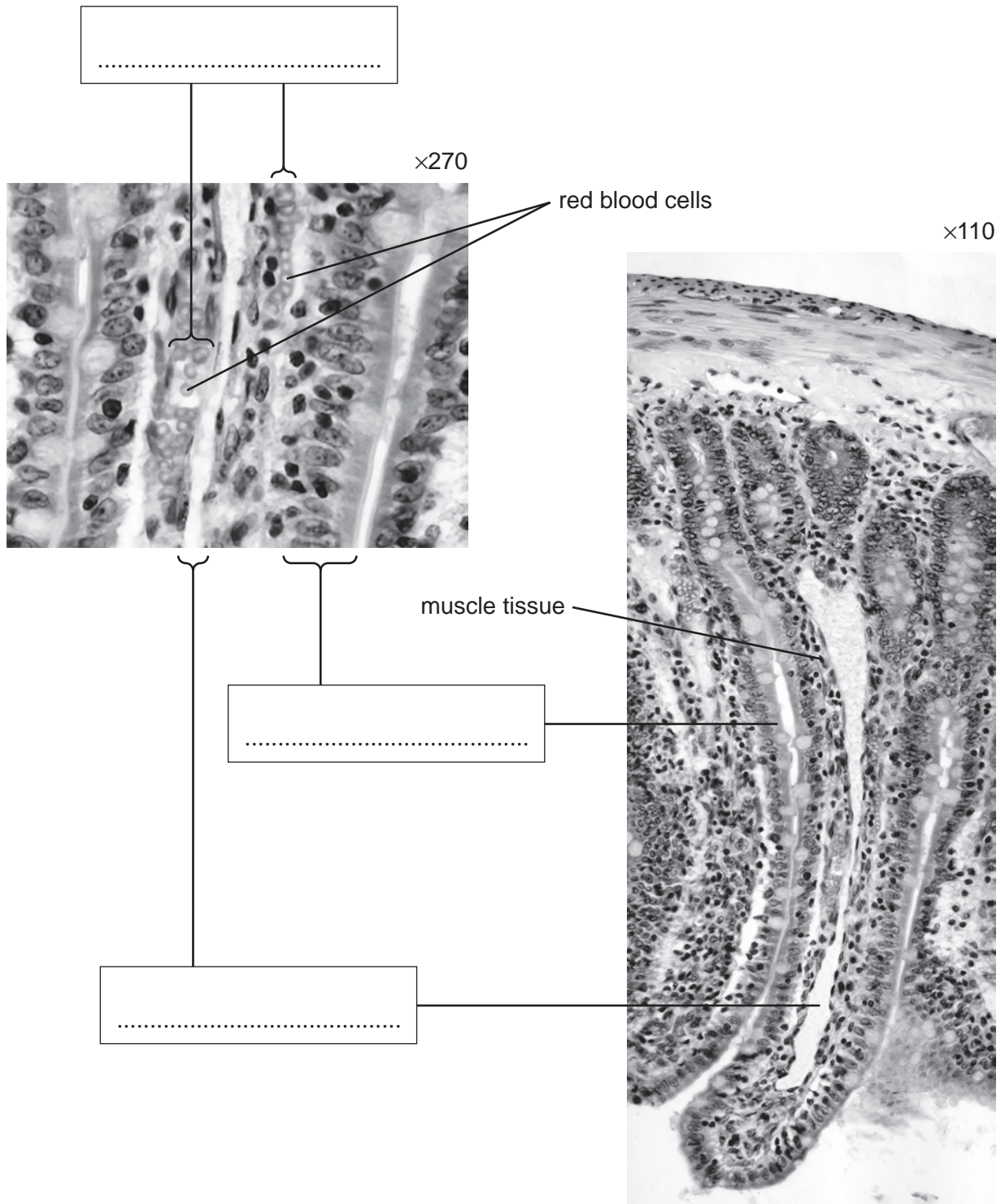
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.....  
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.....  
..... [2]

(d) Name the part of the alimentary canal that is lined by the cells shown in Fig. 1.1 **A**.

..... [1]

[Total: 7]

4 Fig. 1.1 shows a section of a villus at two different magnifications.



**Fig. 1.1**

**(a)** Label the structures shown in Fig. 1.1.

Write the labels in the boxes in Fig. 1.1.

[3]



(b) Suggest the role of the muscle tissue shown in the villus in Fig. 1.1.

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..... [2]

Fig. 1.2 shows an experiment to investigate the uptake of glucose by cells of the villi.

- Two leak-proof bags were set up.
- One bag was made from artificial partially permeable membrane (Visking tubing).
- The other bag was made from a piece of small intestine containing living cells, with its inner surface inside the bag.
- The bags were filled with equal volumes of a dilute glucose solution.
- The bags were suspended in the same glucose solution for two hours.
- After two hours, the volumes of the bags were measured and the contents were tested for the concentration of glucose.

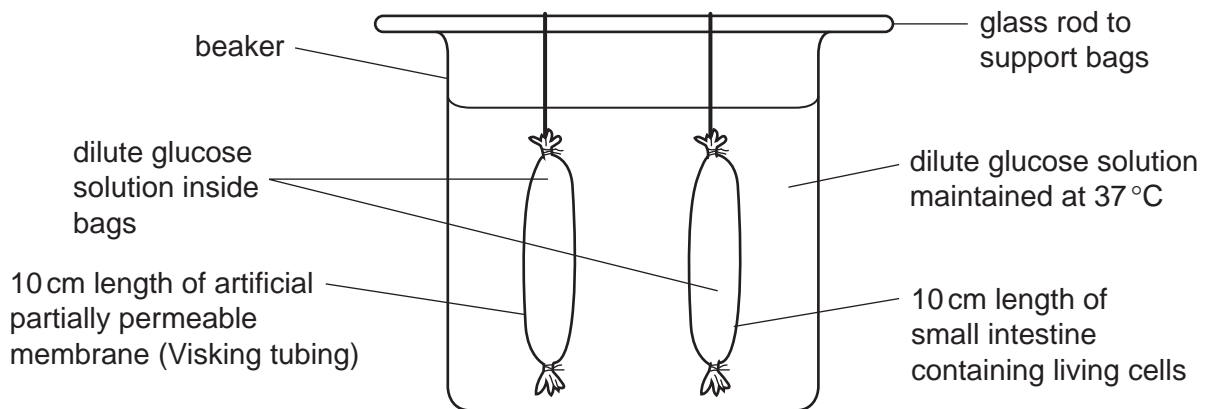


Fig. 1.2

Inside the bag made from small intestine the volume and concentration of the glucose solution decreased. There were no changes to the volume and concentration in the Visking tubing bag.

(c) State **and** explain the process responsible for the **decrease** in the glucose concentration in the bag made from small intestine.

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..... [2]

(d) After two hours there was less water in the bag made from small intestine.

The volume of water in the bag made from small intestine decreased, but the volume in the bag made from Visking tubing did **not** change. Explain why.

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..... [3]

(e) An investigation studied the flow of water into and out of the human alimentary canal. Table 1.1 shows the results.

**Table 1.1**

water <b>into</b> the alimentary canal		water <b>out of</b> the alimentary canal	
source of water	volume of water / dm <sup>3</sup> per day	method of water loss	volume of water / dm <sup>3</sup> per day
water from diet	2.5	stomach to the blood	0.00
saliva	1.5	small intestine to the blood	9.00
gastric juice	2.4	large intestine to the blood	0.85
bile	0.8	in the faeces	0.15
pancreatic juice	0.8		
intestinal secretions	2.0		

(i) Name the part of the alimentary canal that secretes most water in a digestive juice.  
 ..... [1]

(ii) Name the part of the alimentary canal that absorbs most water.  
 ..... [1]

**(iii)** Explain why water is added to food by the secretions shown in Table 1.1.

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..... [3]

**(iv)** Explain why it is important that water is absorbed in the alimentary canal.

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..... [2]

[Total: 17]