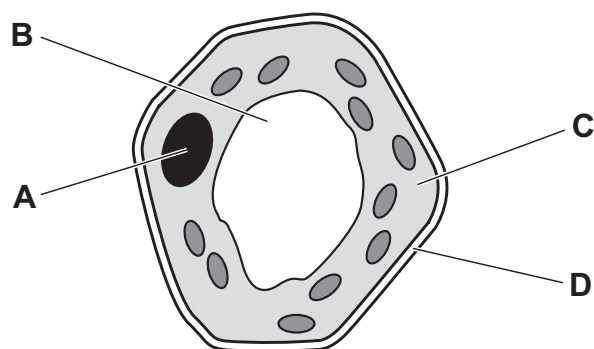


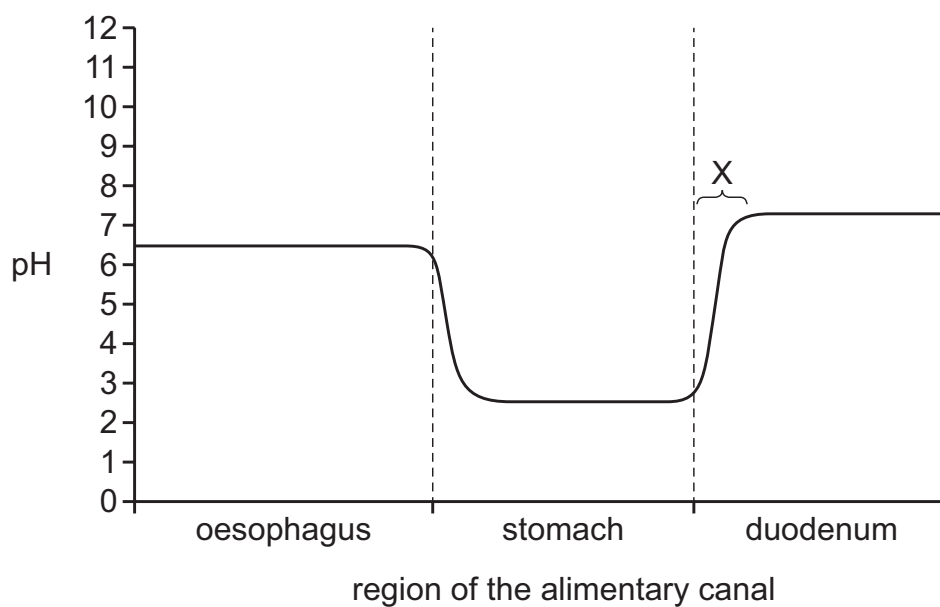
3 The diagram shows a plant cell.

A biologist wants to find out the number of chromosomes it contains.

Which labelled part should be examined more closely?



8 The graph shows the changes in pH in the oesophagus, stomach and duodenum.

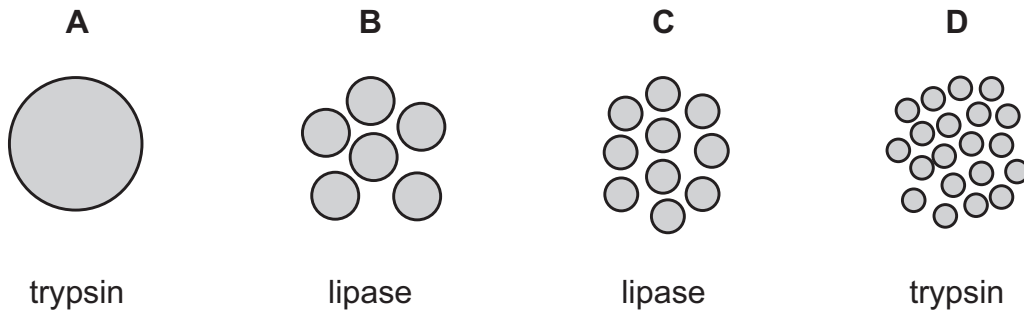


Which substance causes the change in pH at the point labelled X?

- A** bile
- B** gastric juice
- C** glucagon
- D** trypsin

- 7** The diagrams show the same mass of oil arranged in drops of different sizes at the same temperature.

In which combination of oil drop size and enzyme will the oil be digested the fastest?



- 26** What can antibiotics treat?

- A** all diseases caused by pathogens
- B** cholera
- C** HIV (human immunodeficiency virus)
- D** rickets

2 (a) Alveoli are the gas exchange surface in humans.

State **three** features of alveoli that make them an effective gas exchange surface.

1

2

3

[3]

(b) Fig. 2.1 is a diagram of the human breathing system.

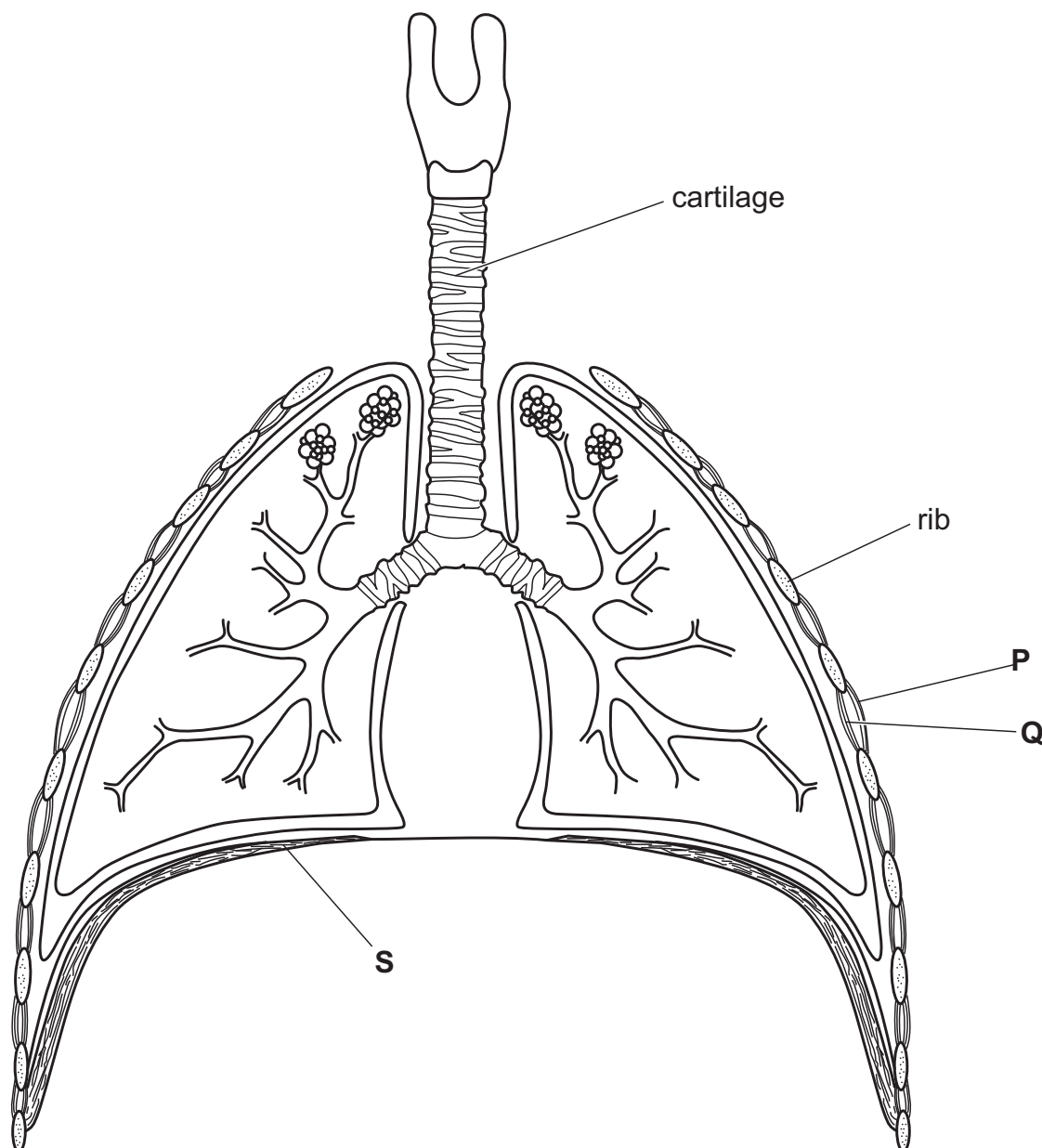


Fig. 2.1

(i) Three muscles involved in inspiration are labelled **P**, **Q** and **S** in Fig. 2.1.

Identify the letters in Fig. 2.1 that label the muscles which contract during inspiration.

..... [1]

(ii) State the function of cartilage in the breathing system.

[1]

(c) (i) State the balanced chemical equation for aerobic respiration.

[2]

(ii) During physical activity breathing changes.

Explain the mechanism that links the increase in physical activity to the changes in breathing.

[3]

[Total: 10]

- 2 (a) Fig. 2.1 is a photograph of an acorn from a Caucasian oak, *Quercus macranthera*.

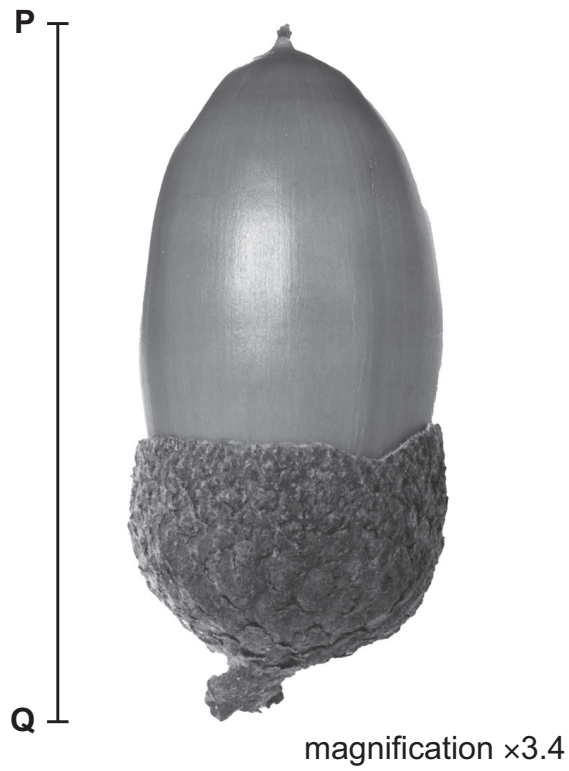


Fig. 2.1

- (i) Make a large drawing of the acorn in Fig. 2.1.

(ii) Line **PQ** represents the length of the acorn in Fig. 2.1.

Measure the length of line **PQ** in Fig. 2.1.

length of line **PQ** mm

Calculate the actual length of the acorn using the formula and your measurement.

$$\text{magnification} = \frac{\text{length of line PQ in Fig. 2.1}}{\text{actual length of the acorn}}$$

Give your answer to **two** significant figures.

Space for working.

..... mm
[3]

- (iii) Fig. 2.2 shows photographs of acorns from a Caucasian oak and from a Turkey oak, *Quercus cerris*.

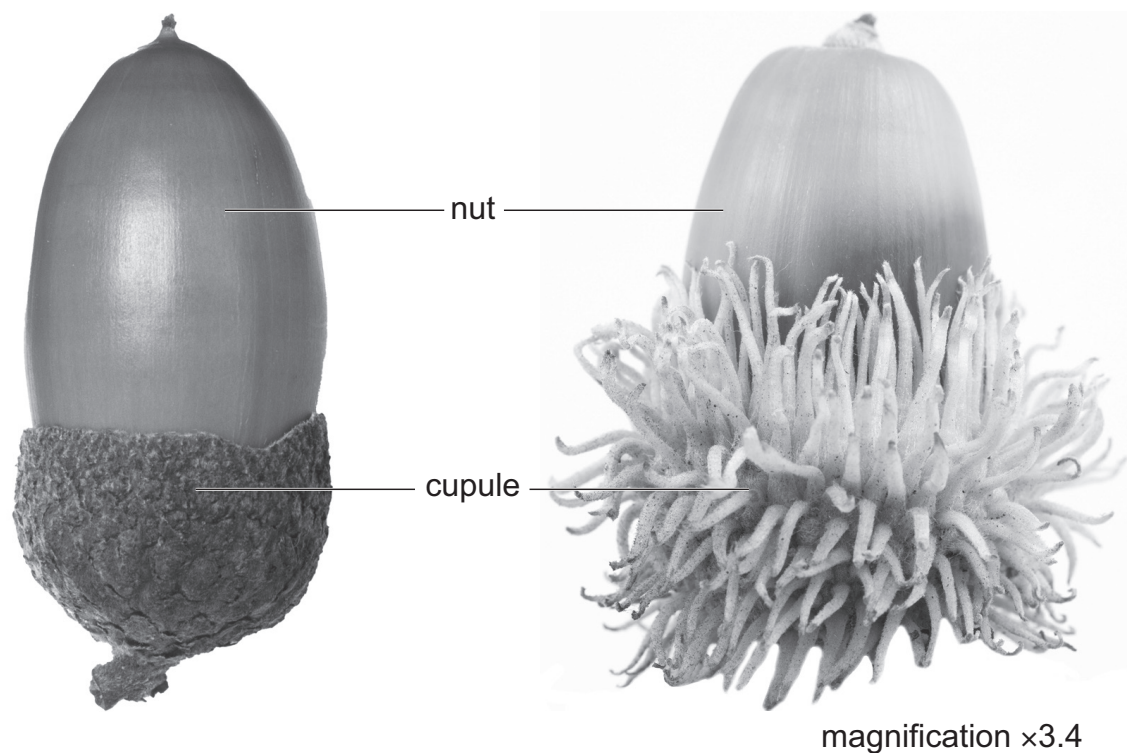


Fig. 2.2

Describe **two** visible differences between the acorns in Fig. 2.2.

- 1
- 2

[2]

- (b) Different species of oak tree have acorns of different masses.

Scientists investigated if the mass of acorns affected the proportion of acorns that germinated in three different species of oak tree.

- The scientists took 100 acorns from each of three species of oak tree.
- The mass of each acorn was measured and recorded.
- Each acorn was then placed in a pot with the same type of soil in a dark room at 25°C and watered every 48 hours.
- The scientists recorded the proportion of acorns that had germinated in 60 days.

- (i) State **two** factors that were kept constant in the investigation described in 2(b).

- 1
- 2

[2]

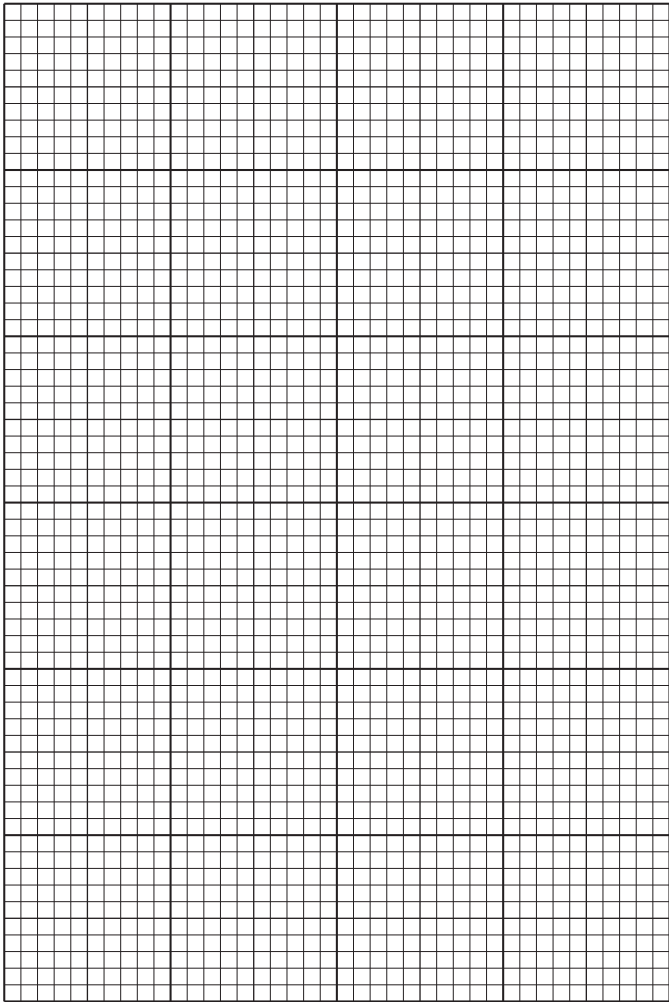
The results are shown in Table 2.1.

Table 2.1

species of oak tree	mean mass of acorns /g	proportion of acorns that germinated
A	0.52	0.44
B	1.92	0.56
C	2.30	0.64

(ii) Plot a bar chart on the grid of **all** the data in Table 2.1.

Include a key on your bar chart.



[4]

(iii) The study measured 100 acorns for each species.

Suggest why a large number of acorns was measured.

.....

.....

(iv) Water is required for germination.

The scientists measured the mass of one acorn from each species. The acorns were then dried in an oven and the mass of each acorn was measured again. The scientists used these data to calculate the percentage water content of the acorns.

The results are shown in Table 2.2.

Table 2.2

species of oak tree	initial mass of the acorn /g	dried mass of the acorn /g	percentage water content of the acorn
A	0.49	0.36	26.5
B	1.96	0.74	
C	2.34	0.98	58.1

Calculate the percentage water content of the acorn from species B.

.....% [1]

(c) State the name of the reagent used to test for protein.

..... [1]

[Total: 18]

- 1 (a) Organisms from the genus *Chlorella* are prototists.

State the additional information required to name *Chlorella* according to the binomial system.

..... [1]

- (b) Fig. 1.1 shows the structure of an organism from the genus *Chlorella*.

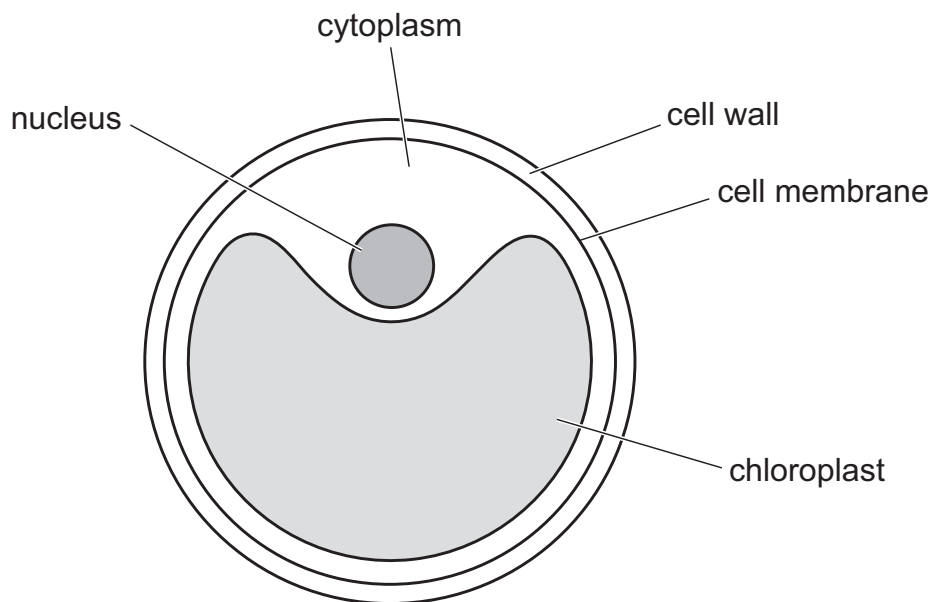


Fig. 1.1

- (i) Identify **two** cell structures in Fig. 1.1 that indicate that *Chlorella* is **not** a prokaryote.

1

2

[2]

- (ii) Identify **two** cell structures in Fig. 1.1 that are found in both fungi and prototists.

1

2

[2]

- (iii) State the names of **two other** kingdoms, apart from fungus, prokaryote and prototist.

..... and [1]

(c) *Chlorella* is sold as a nutritional supplement.

Spirulina is another nutritional supplement.

Table 1.1 shows some nutritional information for *Chlorella* and *Spirulina* supplements and the recommended daily intake for some nutrients.

Table 1.1

nutrient	mass of nutrient / mg per 100 g of supplement		average recommended daily intake in adults / mg per day
	<i>Chlorella</i> supplement	<i>Spirulina</i> supplement	
vitamin C	0.74	0.00	80.00
calcium	120.00	5.10	1000.00
iron	37.00	75.50	12.00

(i) One tablet contains 5 g of *Chlorella* supplement.

Using the information in Table 1.1, calculate the number of tablets of *Chlorella* supplement a person needs to take to provide the recommended daily intake of iron.

Give your answer to **one** decimal place.

Space for working.

..... tablets [3]

(ii) Explain the advantages of taking *Chlorella* as a dietary supplement rather than *Spirulina*.

Use the data in Table 1.1 to justify your answer.

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(iii) State the name of **one** food that is a principal dietary source of vitamin C.

..... [1]

(d) *Chlorella* is also a good source of protein.

(i) State the importance of proteins in active transport.

.....

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..... [2]

(ii) State the name of the smaller molecules that proteins are made from.

..... [1]

[Total: 17]

4 (a) Some algae are single-celled organisms that can photosynthesise. Their cells contain the pigment chlorophyll.

State the name of **one** mineral ion that is needed to make chlorophyll.

..... [1]

(b) A student investigated the effect of light on photosynthesis in algae, using hydrogencarbonate indicator solution.

Carbon dioxide is an acidic gas.

Table 4.1 shows the colour of the hydrogencarbonate indicator solution at different pH values.

Table 4.1

pH	7.6	8.4	9.2
colour of indicator	yellow	red	purple

(i) Two test-tubes were set up at the same time. Both contained algae and hydrogencarbonate indicator. At the start of the investigation the hydrogencarbonate indicator was red in both test-tubes.

One test-tube was placed in the dark and one test-tube was placed in the light.

After 20 minutes, the contents of the test-tube in the dark were yellow and the contents of the test-tube in the light were purple.

Explain these results.

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..... [4]



(ii) Fig. 4.1 is a graph showing the effect of light intensity on the rate of photosynthesis.

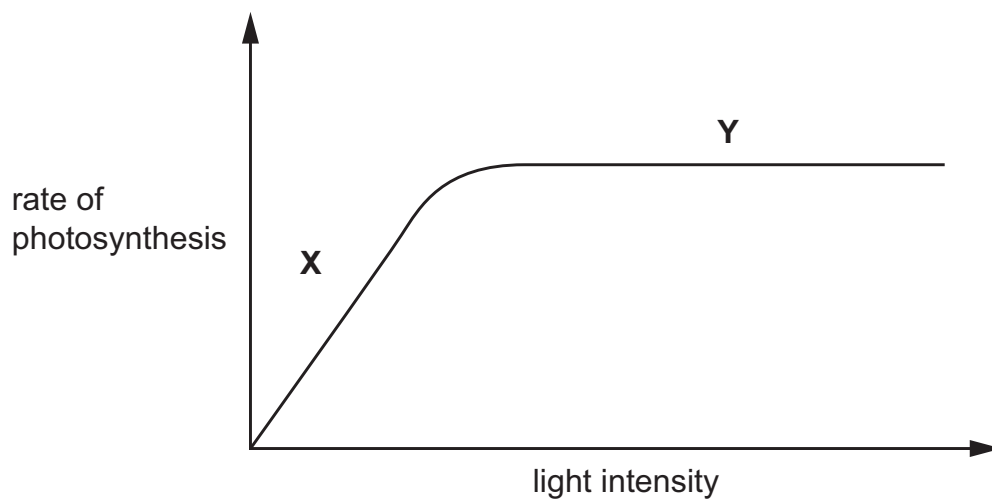


Fig. 4.1

State which factors could be limiting the rate of photosynthesis at **X** and at **Y** in Fig. 4.1.

.....

.....

..... [3]



(c) Starch and sucrose are made by plants after photosynthesis.

- (i) State the name of the tissue that transports sucrose around the plant **and** the name of **one other** biological molecule that is transported in this structure.

tissue

biological molecule

[2]

- (ii) Describe how starch is broken down in the human digestive system so that it can be absorbed into the blood.

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..... [6]

[6]

[Total: 16]

- 5 (a) Describe **two** ways in which the circulatory system of a fish is different from the circulatory system of a mammal.

1

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2

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[2]

- (b) Explain the advantages of a double circulatory system.

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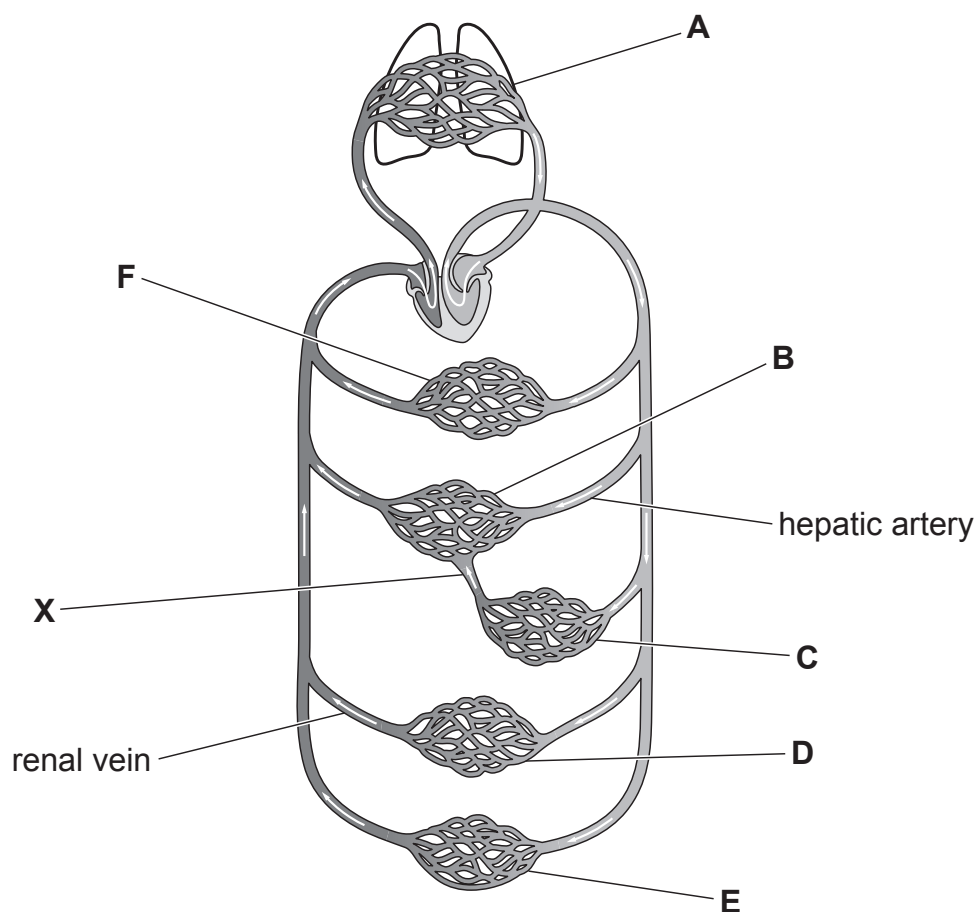
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[3]

- (c) Fig. 5.1 shows part of the circulatory system of a mammal.



(i) State the letter from Fig. 5.1 that identifies where these processes occur:

- absorption of the products of digestion into the blood
- excretion of carbon dioxide from the body
- formation of urine
- production of bile.
- [4]

(ii) Identify the name of the blood vessel labelled X in Fig. 5.1.

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[1]

(d) Describe the role of the liver in excretion.

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[4]

[Total: 14]