



Cambridge International AS & A Level

CANDIDATE NAME



CENTRE NUMBER

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BIOLOGY

9700/23

Paper 2 AS Level Structured Questions

October/November 2024

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 60.
- The number of marks for each question or part question is shown in brackets [].

This document has **20** pages. Any blank pages are indicated.





1 Fig. 1.1 shows the structure of the human gas exchange system.

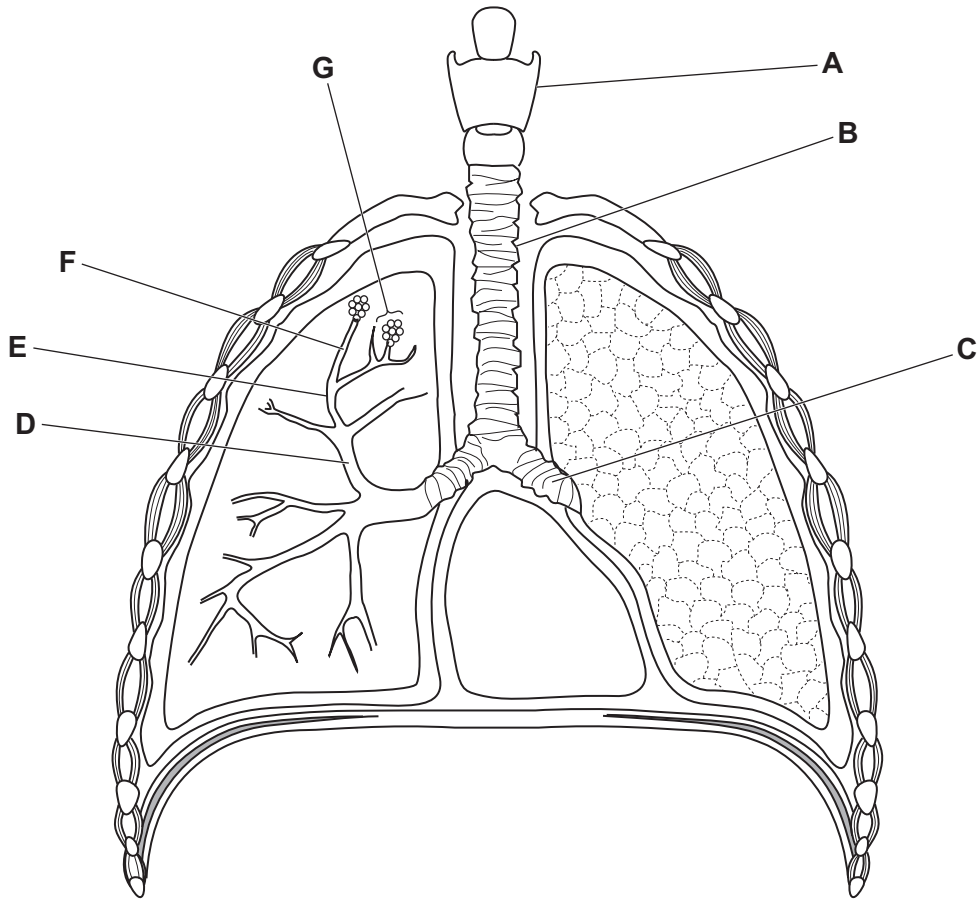


Fig. 1.1

(a) (i) Use the letters in Fig. 1.1 to identify the parts of the gas exchange system that contain cartilage.

..... [1]

(ii) Describe the role of cartilage in the gas exchange system.

.....

.....

.....

.....

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..... [2]

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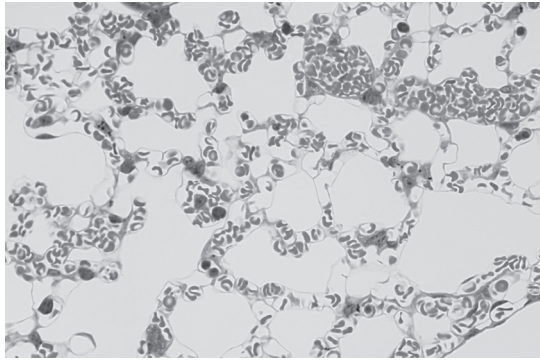
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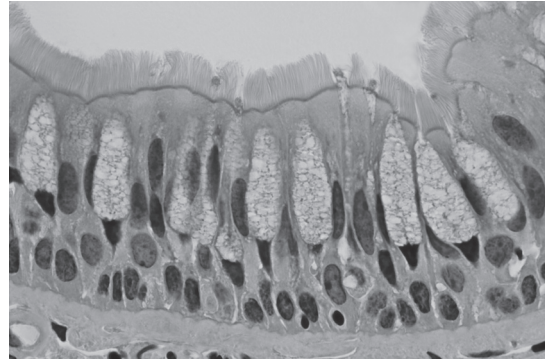
(iii) Microscope slides were prepared from two regions of the gas exchange system.

Fig. 1.2 and Fig. 1.3 are photomicrographs of the two slides.



x120

Fig. 1.2



x560

Fig. 1.3

Complete Table 1.1.

- Use the letters from Fig. 1.1 to identify the regions of the gas exchange system from which the two slides were prepared.
- Identify **one** feature visible in Fig. 1.2 **and one** feature visible in Fig. 1.3.
- State **one** way in which each feature relates to its function.

Table 1.1

Fig.	region of the gas exchange system (A, B, C, D, E, F or G)	one visible feature	one way in which the feature relates to its function
1.2			
1.3			

[4]



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Question 2 starts on page 6



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- 2 Stem cells are found throughout the human body. Lgr5⁺ stem cells are found in the lining of the small intestine.

Fig. 2.1 is a flow chart showing stages in the development of one of the daughter cells produced by the mitotic division of an Lgr5⁺ stem cell.

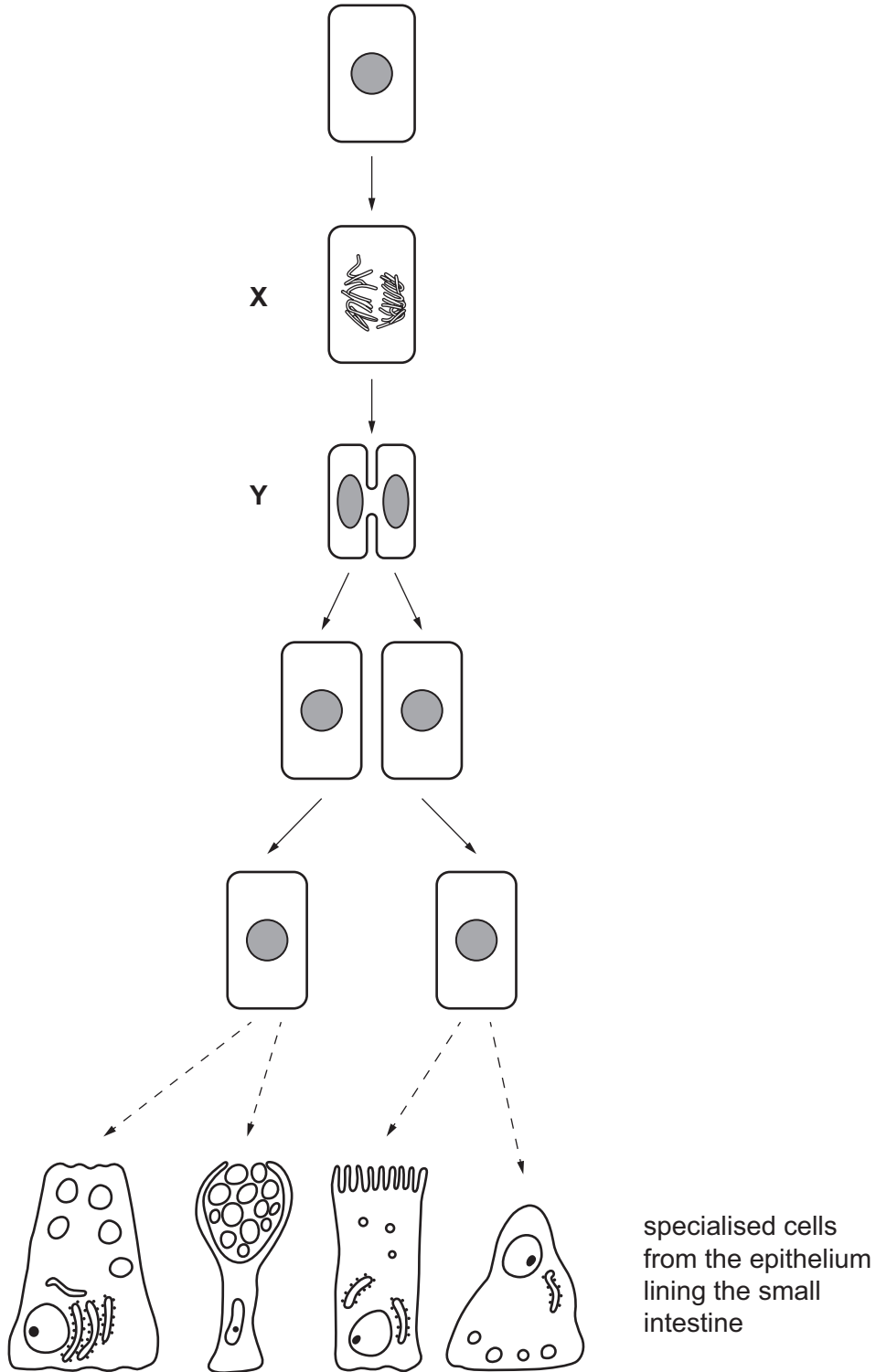


Fig. 2.1





(a) (i) Explain why stem cells are required in places such as the lining of the small intestine.

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

(ii) Name the stage of mitosis shown in cell X in Fig. 2.1.

..... [1]

(iii) State the part of the cell cycle shown at Y in Fig. 2.1.

..... [1]

(b) Explain the role of centromeres in the cell cycle.

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

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(c) Fig. 2.2 shows three types of specialised cell that develop from Lgr5⁺ stem cells in the small intestine.

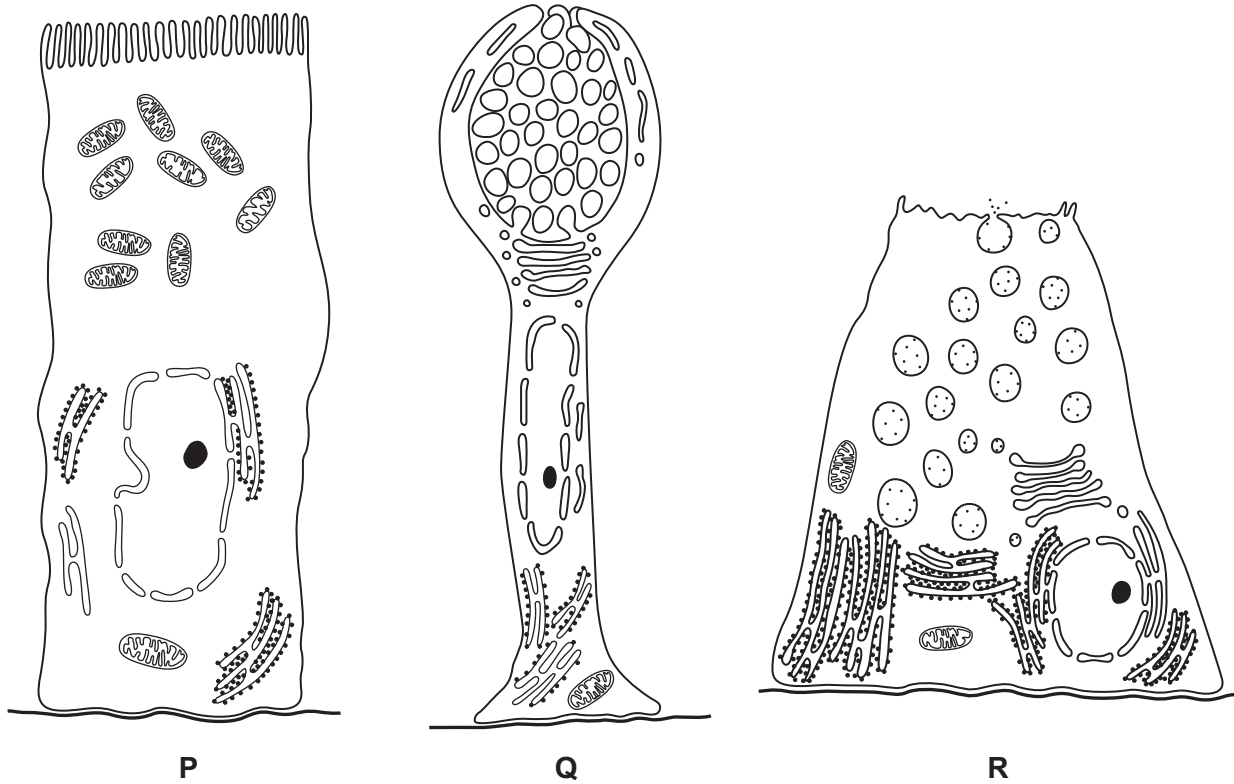


Fig. 2.2

The structural features of a cell indicate its likely function.

Suggest a function of each of the cells shown in Fig. 2.2, **and** explain how the structure of each cell supports your suggestion.

cell **P** function

explanation

.....

.....

cell **Q** function

explanation

.....

.....

cell **R** function

explanation

.....

.....

[6]

[Total: 12]



- 3 The five bases found in nucleic acids are described as nitrogenous organic compounds. There are two types of base.

Fig. 3.1 shows the structure of the five bases.

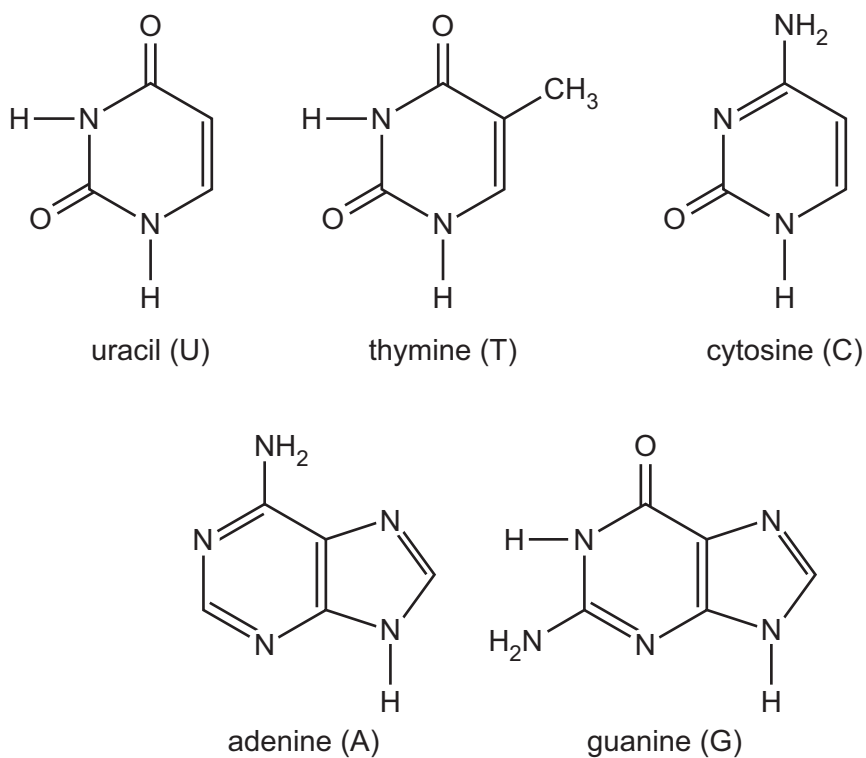


Fig. 3.1

- (a) (i) State the name of the type of base that includes U, T and C.

..... [1]

- (ii) State why it is **not** correct to say that all nucleic acids have five bases.

.....
 [1]





(b) Fig. 3.2 shows a stage in the replication of DNA. The circled part is enlarged in Fig. 3.3 to show the elongation of the DNA strand that is being synthesised.

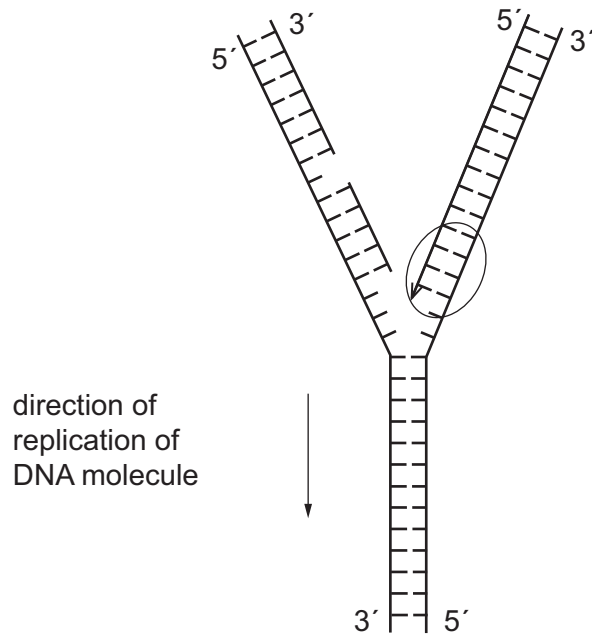


Fig. 3.2

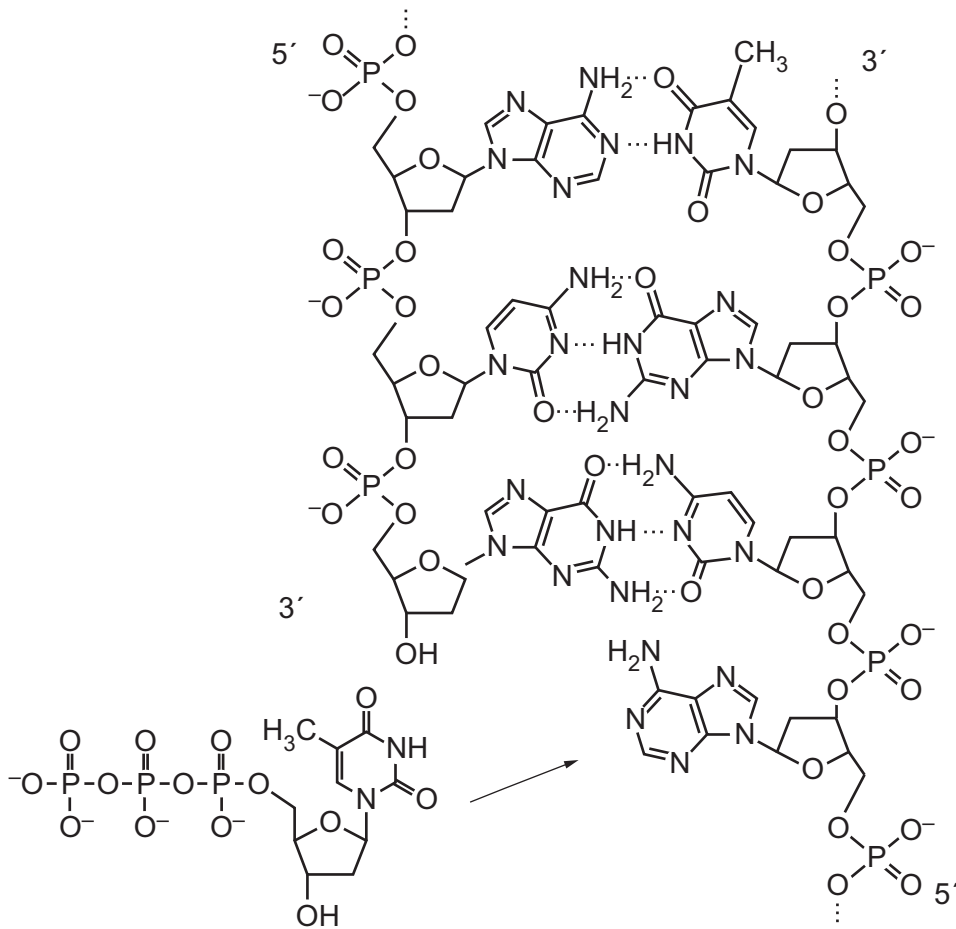


Fig. 3.3

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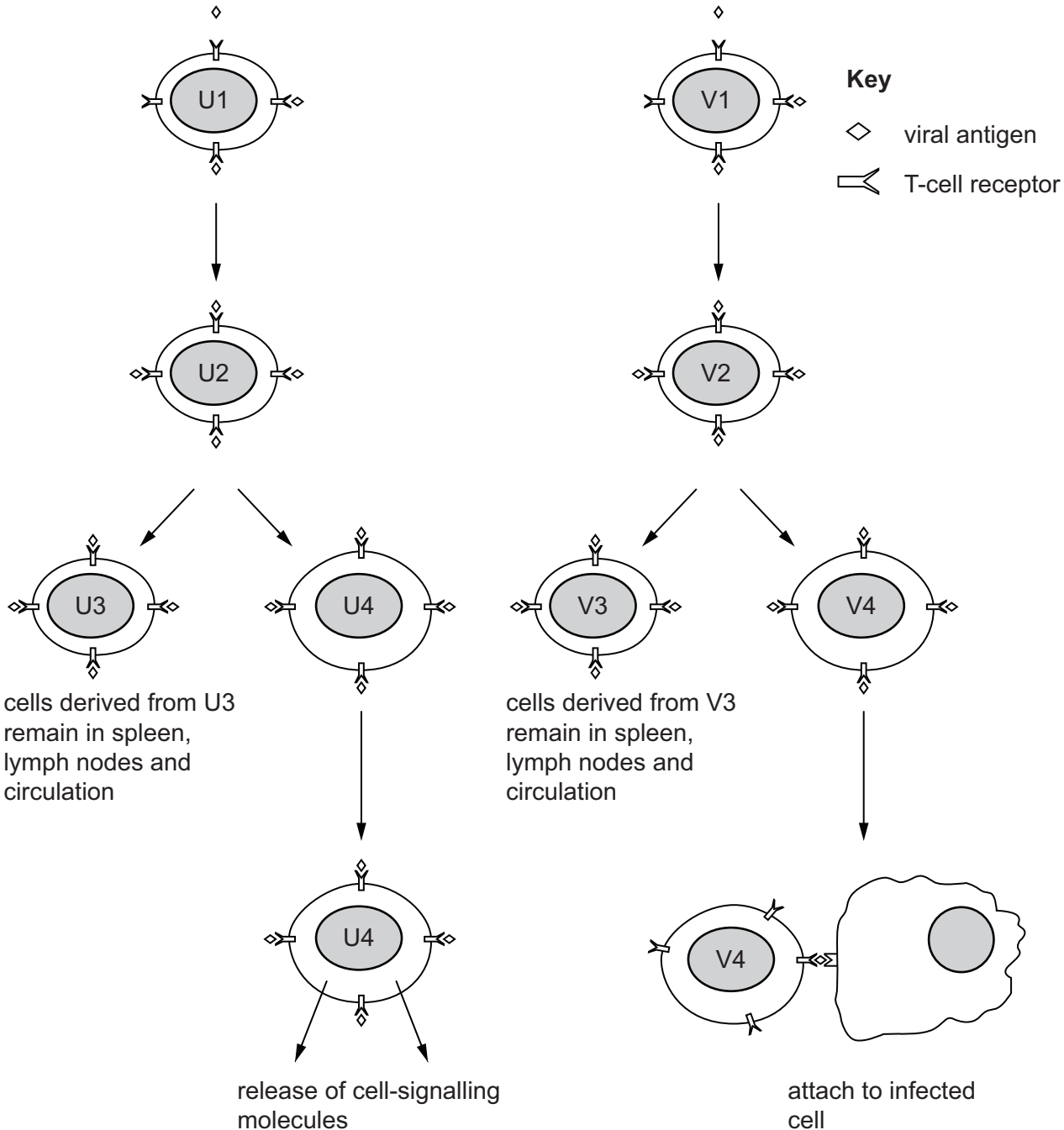




5 T-lymphocytes are produced in bone marrow and mature in the thymus gland.

When mature, T-lymphocytes leave the thymus gland to travel throughout the body. They remain inactive inside organs, such as the spleen and lymph nodes, until activated by the presence of antigens.

Fig. 5.1 shows what happens to two inactive T-lymphocytes, **U1** and **V1**, in the presence of an antigen from a virus.



Not to scale

Fig. 5.1





6 (a) A student constructed a table to compare the structural features of a plant cell, a prokaryotic cell and a virus.

Complete Table 6.1.

Table 6.1

feature	plant cell	prokaryotic cell	virus
external structure	cell wall composed of cellulose	cell wall composed of	capsid composed of
size of ribosomes	80S and 70S	no ribosomes
nucleic acids	DNA and RNA	DNA and RNA

[4]

(b) The cholera bacterium releases a protein toxin called cholera toxin. The toxin causes the loss of chloride ions and water from epithelial cells into the lumen of the intestine.

Fig. 6.1 shows the events that occur in cells lining the intestine when cholera toxin binds to the membrane of one of these cells.

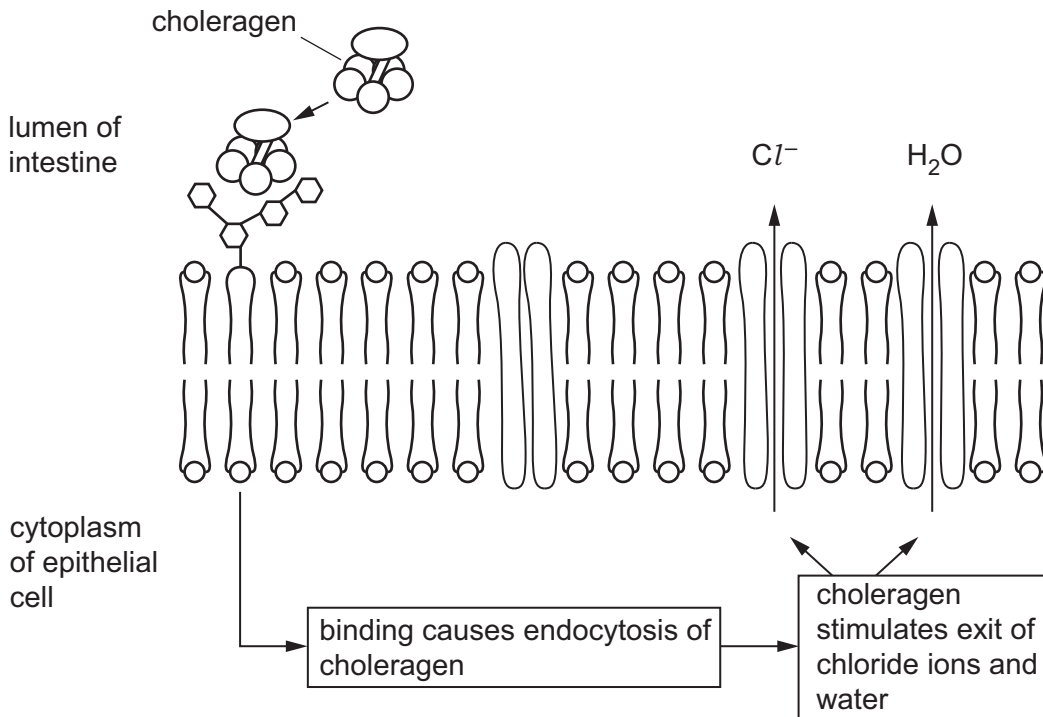


Fig. 6.1

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(i) State **one** likely source of an outbreak of cholera.

..... [1]

(ii) With reference to Fig. 6.1, state why cholera toxin molecules are described as having quaternary structure.

..... [1]

(iii) State the type of cell membrane component that forms the receptor for cholera toxin.

..... [1]

(iv) The process by which chloride ions leave the epithelial cell requires energy.

Name the phosphorylated nucleotide that is needed for this process.

..... [1]

(v) Explain why water also moves from epithelial cells into the lumen of the intestine when cholera toxin is present.

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

[Total: 10]

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