

Excretion

Question Paper 3

Level	A Level
Subject	Biology
Exam Board	OCR
Module	Communication, homeostasis and energy
Topic	Excretion
Booklet	Question Paper 3

Time allowed: 51 minutes

Score: /38

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E
>69%	56%	50%	42%	34%	26%

Question 1

The kidneys of a healthy individual filter $178 \text{ dm}^3 \text{ day}^{-1}$ of fluid from the glomeruli into the renal capsules. However, only $1.5 \text{ dm}^3 \text{ day}^{-1}$ of urine is produced.

What percentage of the filtrate is reabsorbed back into the blood?

- A 176.5
- B 0.8
- C 11.8
- D 99.2

[Total: 1]

Fig. 5.1 is a photomicrograph of a horizontal section through the cortex of a mammalian kidney.

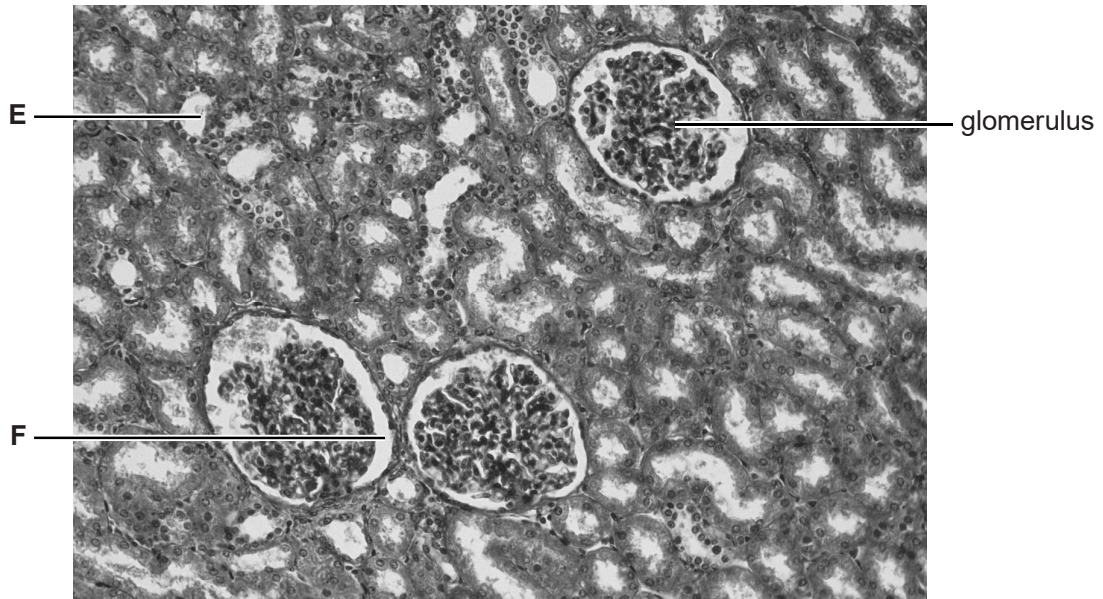


Fig. 5.1

(a) Identify the structures labelled **E** and **F** in Fig. 5.1. [2]

E

F

(b) (i) Explain how the glomerulus is able to perform its function.



In your answer, you should use appropriate technical terms, spelt correctly.

[3]

(ii) **Name** the specialised cells present in structure **F** that assist in the function you described in (b)(i). [1]

(c) Kidney failure has serious consequences for the individual.

(i) Suggest the effects of complete kidney failure on the **composition of the blood**. [2]

(ii) One way of treating a person with kidney failure is by giving them a kidney transplant.

Explain the need for close matching of the donated kidney to the recipient. [3]

[Total: 11]

(a) Fig. 5.1 is a drawing representing a vertical section through a mammalian kidney.

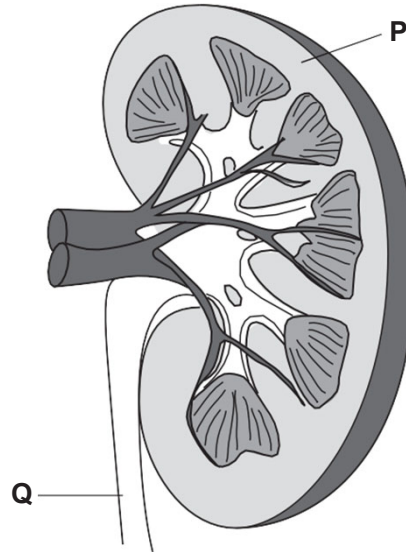


Fig. 5.1

Name the region **P** and the structure **Q**.

P

Q

[2]

(b) (i) Each kidney contains approximately one million nephrons. Each section of a kidney nephron is adapted to perform its function effectively.

Describe the features of the **glomerulus** and **Bowman's capsule** that allow them to perform their function effectively.



In your answer, you should use appropriate technical terms, spelt correctly.

[4]

(ii) Nephritis is a condition in which the tissue of the glomerulus and proximal convoluted tubule becomes inflamed and damaged.

Suggest **two** differences in the composition of the urine of a person with nephritis when compared to the urine of a person with healthy kidneys.

[2]

- (c) Caffeine is a mild diuretic. Caffeine prevents the introduction of additional aquaporins into the wall of the collecting duct of the nephron and therefore additional water is not removed from the urine.

Aquaporins are channels in the cell surface membrane that allow water molecules to pass through.

Fig. 5.2 represents an aquaporin.

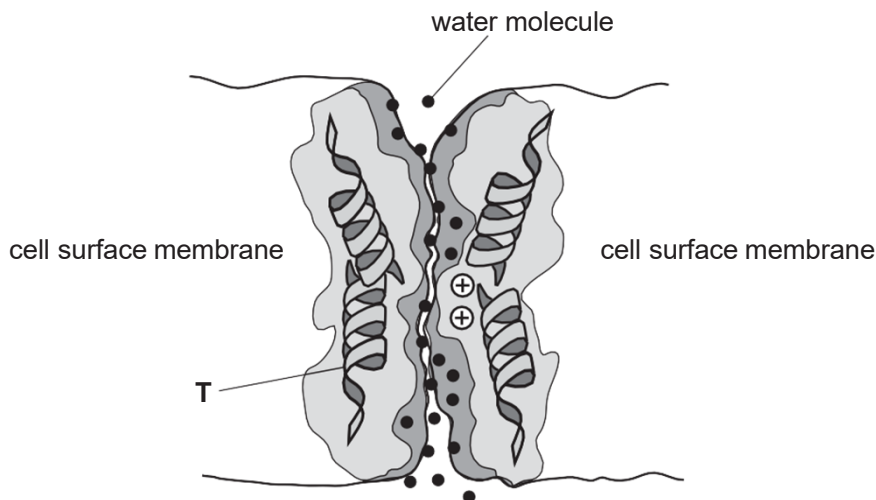


Fig. 5.2

- (i) Identify the type of molecule labelled T. [1]

- (ii) The aquaporin allows water to travel from the collecting duct into the surrounding tissues but prevents the passage of ions such as sodium ions and potassium ions.

With reference to Fig.5.2, suggest **two** ways in which the structure of this aquaporin prevents the passage of ions. [2]

[Total: 11]

Question 4

Osmoregulation is a key feature of homeostasis and maintains the water potential of the blood within certain limits. This is achieved by the action of anti-diuretic hormone (ADH).

- (a) Explain the likely effect on the blood cells if the water potential of the plasma was allowed to increase significantly.

[2]

Fig. 4.1 is a simplified diagram of the structure of ADH.

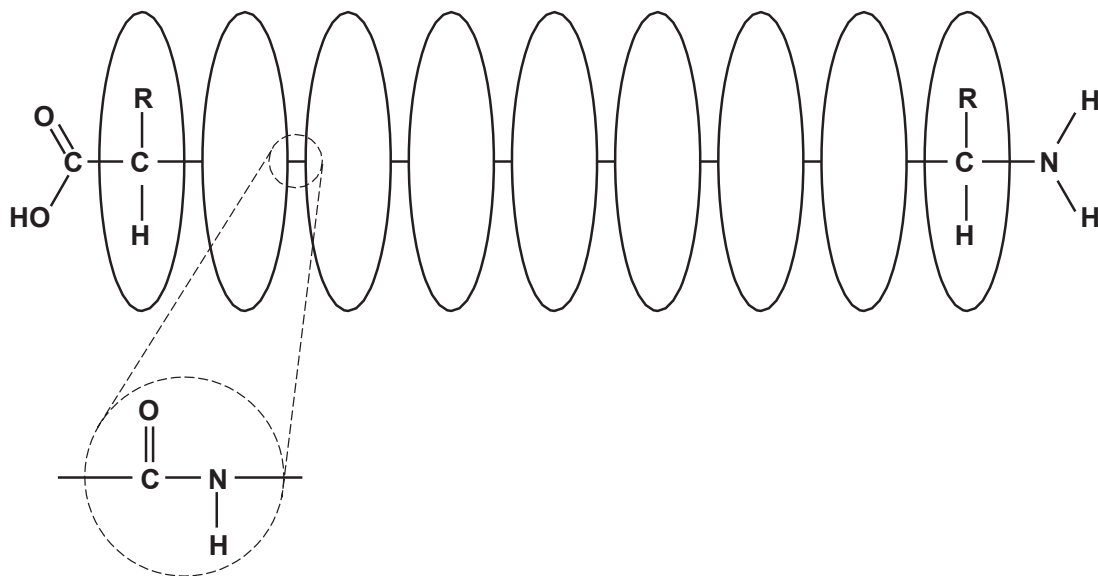


Fig. 4.1

- (b) Name the type of monomer that makes up a molecule of ADH and the bond that joins the monomers together.

[2]

type of monomer

name of bond

(c) Complete the following passage, using the **most suitable** term in each case: [8]

ADH is a hormone that is produced by specialised nerve cells known as cells. These cells detect changes in the water potential of the blood flowing through the If the water potential of the blood is too low then ADH is released.

ADH is not secreted immediately into the blood but passes along the of the specialised nerve cells to the gland, from where it is released into the blood.

ADH acts on the cells of the

The ADH molecule attaches to receptors on the of these cells and causes protein channels known as to insert themselves into the membrane. Water passes through these channels by and a smaller volume of more concentrated urine is produced.

(d) ADH does not stay in the blood indefinitely.

Suggest where ADH is removed from the blood **and** describe what then happens to the ADH molecule.

[3]

[Total: 15]