Excretion

Question Paper 1

Level	A Level
Subject	Biology
Exam Board	OCR
Module	Communication, homeostasis and energy
Topic	Excretion
Booklet	Question Paper 1

Time allowed: **54 minutes**

Score: **/40**

Percentage: **/100**

Grade Boundaries:

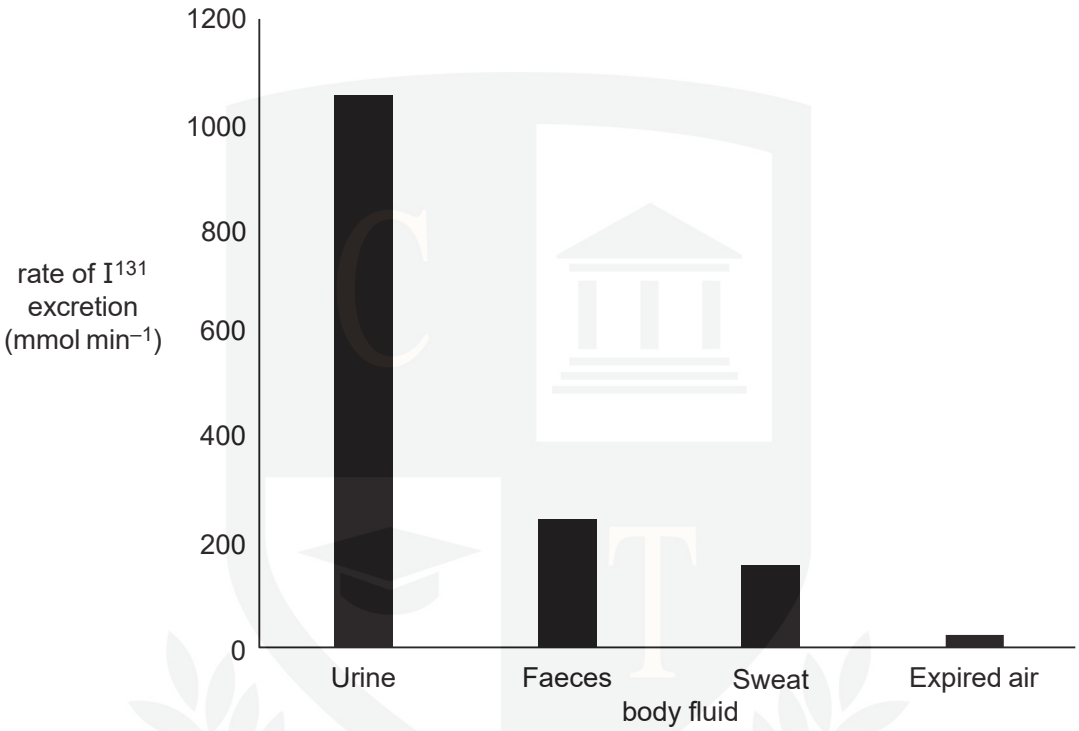
A*	A	B	C	D	E
>69%	56%	50%	42%	34%	26%

Question 1

One treatment for thyroid cancer is radioactive iodine. The radioisotope I^{131} is used.

The thyroid gland absorbs any iodine that enters the body, so the radioactive isotope kills the cancerous cells in the thyroid gland. The I^{131} is then excreted from the body.

Different body fluids excrete different proportions of I^{131}, as shown in the following graph.



Which of the following, **A** to **D**, correctly explains the different proportions of I^{131} in each body fluid?

A. I^{131} is very soluble in water.

B. I^{131} is able to cross capillary walls.

C. The kidneys are more efficient at excreting I^{131} than the lungs.

D. The thyroid gland is well supplied with blood.

[Total: 1]

Question 2

Patients with kidney failure can be treated in different ways.

Which of the following statements describes a feature of peritoneal dialysis?

1 Urea and mineral ions pass into the tissue fluid.
2 Blood is passed over an artificial membrane to remove toxins.
3 The patient receives immunosuppressant medication.

A 1, 2 and 3

B Only 1 and 2

C Only 2 and 3

D Only 1

[Total: 1]

Question 3

The hormone hCG can be detected in urine using pregnancy tests.

Which of the following properties of the hormone hCG allows it to be detected in urine?

A. hCG is a polar molecule

B. hCG has a molecular mass of less than 69,000

C. hCG is a polypeptide

D. hCG binds to cells using glycoproteins

[Total: 1]

Question 4

The process of ultrafiltration in the kidney shares similarities with the formation of tissue fluid.

(a) * Describe the similarities and differences between ultrafiltration and the formation of tissue fluid.

[6]

(b) A person's glomerular filtration rate (GFR) provides an indication of the health of their kidneys. The GFR is a measure of the volume of blood that can be filtered by the kidneys every minute.

GFR can be estimated by monitoring the blood concentration of creatinine, which is a breakdown product of creatine phosphate in muscles.

(i) Suggest **two** characteristics of a patient that must be taken into account when using this GFR measurement to diagnose kidney damage.

Explain why each characteristic must be considered. **[4]**

(ii) If kidney damage is suspected, the patient's urine is likely to be tested for the protein albumin.

Explain why the presence of albumin in the urine indicates kidney damage. **[1]**

[Total: 11]

Question 5

Cirrhosis of the liver can result from long-term liver damage. Alcohol or other toxins can cause this damage.

Scientists have suggested that cirrhosis can be detected by taking samples of body fluids and testing them for two different molecules: C-reactive protein and copeptin.

The liver produces these two molecules, and increased levels can indicate liver damage due to cirrhosis.

Different bodily fluids from a patient suspected of having cirrhosis were tested for C-reactive protein and copeptin.

Fig. 17.1 is a graph of the results.

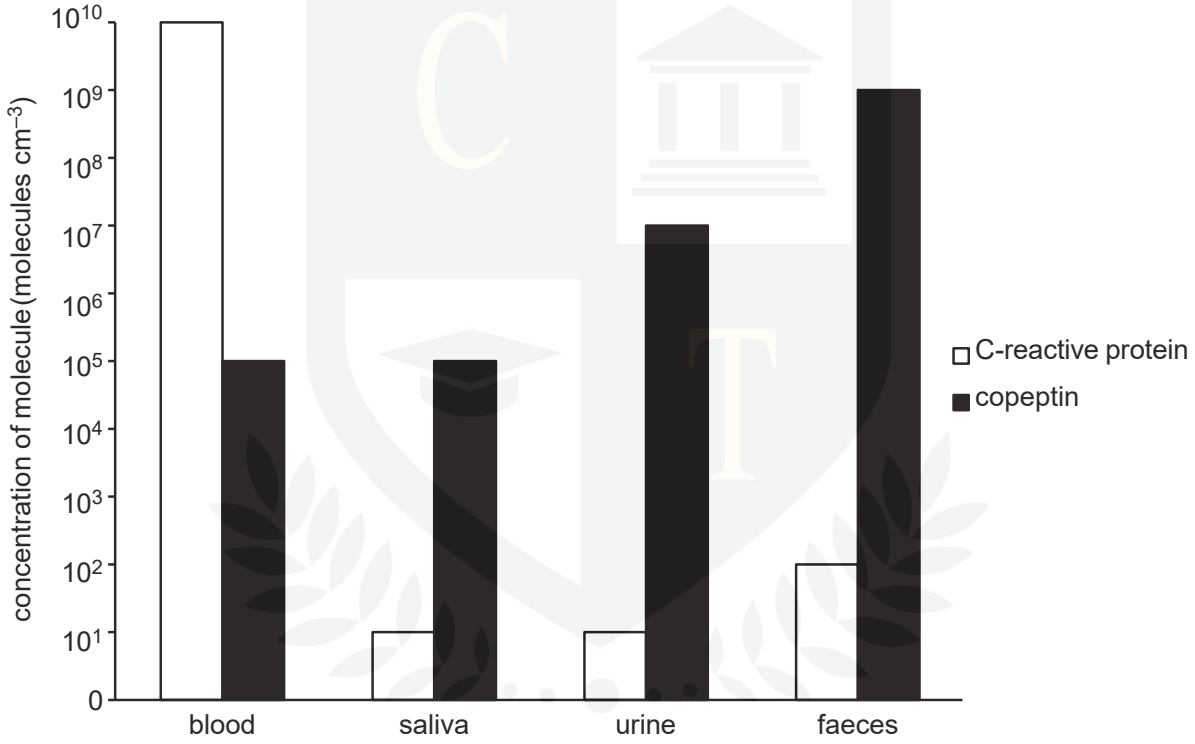


Fig. 17.1

(a) Different bodily fluids have different concentrations of the different molecules.

(i) Calculate the order of magnitude by which concentration of copeptin in the **faeces** is higher than the concentration of C-reactive protein in the **saliva**.

Show your working. **[2]**

(ii) Suggest why blood and faeces have the highest concentrations of C-reactive protein and copeptin. **[2]**

(b) Fig. 17.2 is an image of a Kupffer cell from the liver.

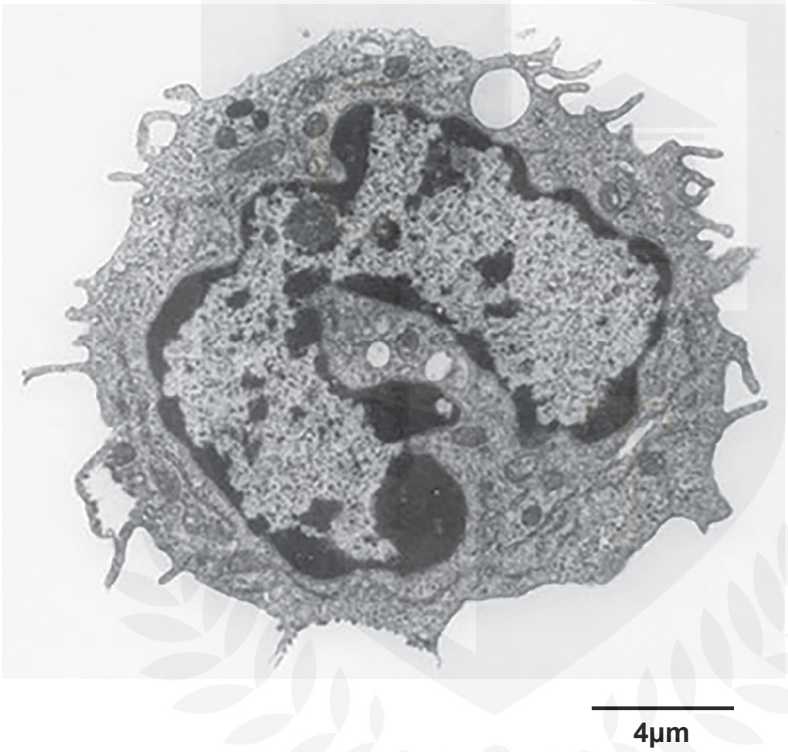


Fig. 17.2

(i) The diameter of the Kupffer cell in the image is 9.1 cm. Assuming it is spherical, calculate the actual volume of this cell.

Give your answer to **four** significant figures. Show your working. **[3]**

(ii) Which type of microscope has been used to obtain this image? Explain your answer.

[2]

[Total: 9]

Question 6

The kidney is very important for the correct functioning of the body as it has a vital role in excretion.

(a) Define the term *excretion*. **[1]**

(b) Fig. 2.1 is a diagram of the external view of a mammalian kidney. The diagram also shows the associated blood vessels and the ureter.

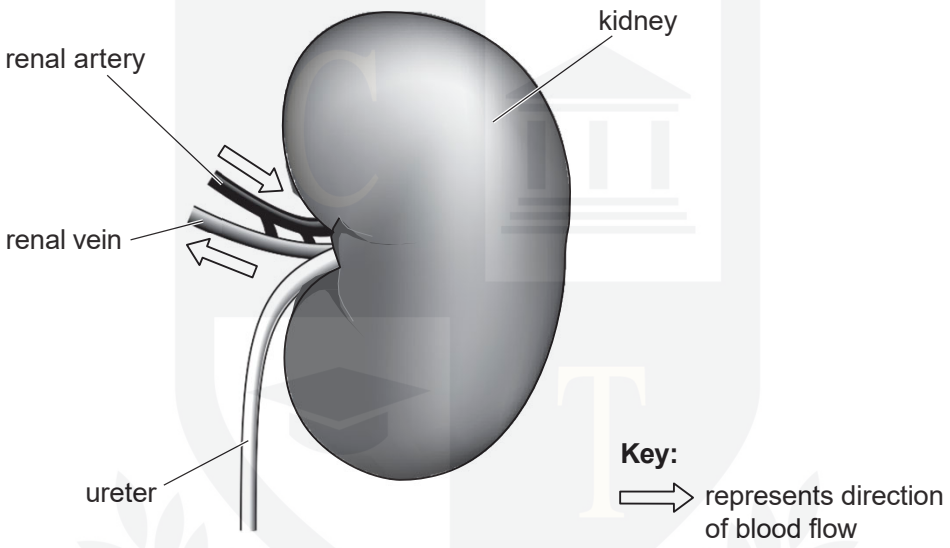


Fig. 2.1

Table 2.1 lists some of the components of blood. Table 2.1 also shows the amount of each component in the renal vein compared with the renal artery.

The differences or similarities shown in Table 2.1 result from the blood passing through the kidney.

Complete Table 2.1 by providing an explanation for the difference or similarity in the amount of each component. The first explanation has been completed for you.

Component of blood	Amount in renal vein compared with that in renal artery	Explanation
urea	much less	When the blood enters the glomerulus, most of the urea gets filtered out of the blood. But some of it is reabsorbed as it goes through the nephron, so there is still a small amount in the renal vein.
ions	slightly less	
glucose	slightly less	
oxyhaemoglobin	less	
red blood cells	the same	

Table 2.1 **[4]**

(c) Anti-diuretic hormone (ADH) helps to regulate the water potential of the blood.

(i) State where ADH is **produced**. **[1]**

(ii) On which region of a kidney nephron are the ADH receptors found? **[1]**

(d) Drugs, known as diuretic drugs, are often given to patients with high blood pressure.

Suggest how the action of these drugs results in a lowering of blood pressure. **[2]**

[Total: 9]

Question 7

The liver is an organ that is metabolically very active, carrying out over 500 different functions. Some of its important functions include converting chemicals including toxins, into other compounds.

Fig. 2.1 outlines some of the reaction pathways that take place in the liver cells.

The ***underlined words*** represent toxic compounds.

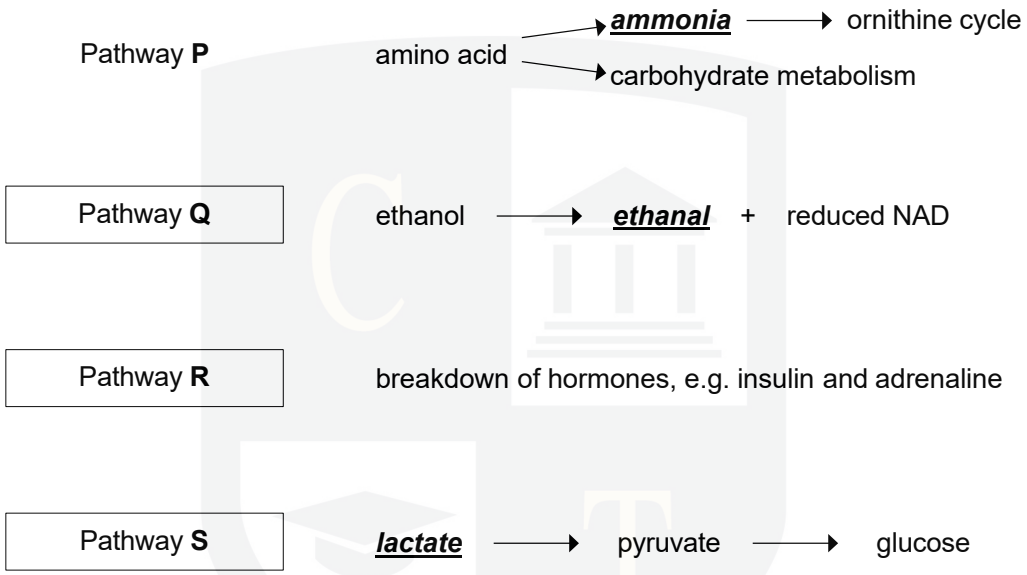


Fig. 2.1

(a) **(i)** State the product of the ornithine cycle in Pathway **P** and the organ to which this product is transported for removal from the body.

[2]

product

organ the product is transported to

(ii) The lactate that enters pathway **S** is produced by cells, such as muscle cells, undergoing anaerobic respiration.

Suggest why this lactate is converted into pyruvate by the hepatocytes (liver cells) rather than by the respiring cells in which it is produced.

[1]

(b) Insulin only remains in the bloodstream for a relatively short time. Pathway **R** breaks down insulin in the liver.

Explain what might happen to a person if the liver did not break down insulin. **[2]**

(c) Alcohol (ethanol) is oxidised in the liver by Pathway **Q**. If a person has a high alcohol intake, it will result in the production of excess reduced NAD.

(i) Excess reduced NAD in the liver cells will influence some metabolic pathways by:

- inhibiting the conversion of lactate to pyruvate
- inhibiting fatty acid oxidation
- promoting fatty acid synthesis.

Using this information **and** the information in Fig. 2.1, suggest the consequences for **liver metabolism** if a person has a regular high alcohol intake.

[2]

(ii) State **precisely** where in the liver cell the excess reduced NAD can be re-oxidised. **[1]**

[Total: 8]