

Excretion in Humans

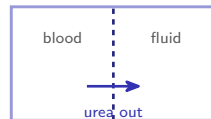
IGCSE Biology ■ Topic 13

IGCSE Biology



What we will cover

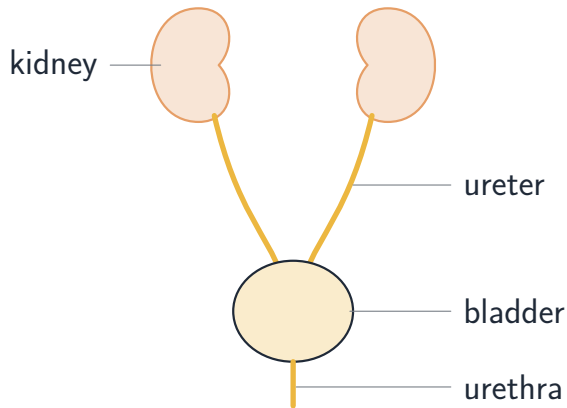
- 1 Excretion & the urinary system
- 2 The nephron
- 3 The liver & urea
- 4 Dialysis



dialysis



Excretion and the urinary system



- **carbon dioxide** – made during respiration, and breathed out through the lungs.
- **urea** – made in the **liver** , and removed by the kidneys together with excess water and **ions** .

The plumbing, and what the liver does first

Ureters

The **ureters** are the tubes from the kidneys to the bladder; the urethra carries urine out.

Nephrons

Each kidney holds millions of tiny tubes called **nephrons** – the filtering unit, repeated.

Deamination

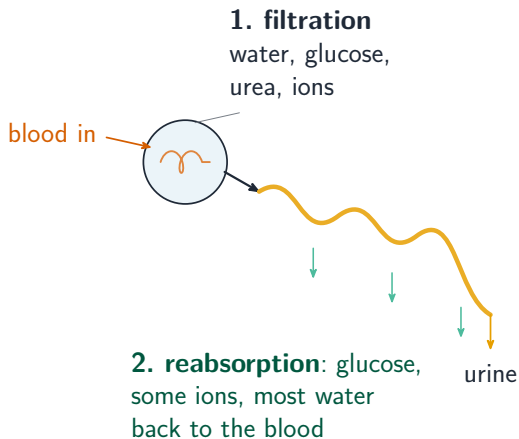
Excess amino acids cannot be stored. The liver removes the **nitrogen**-containing part – **deamination** – and turns it into **urea**.

Assimilation

The liver also carries out the **assimilation** of **amino acids** : joining them into the proteins the body needs.

The kidney does not *make* urea; the liver does. The kidney only removes it from the blood.

The nephron



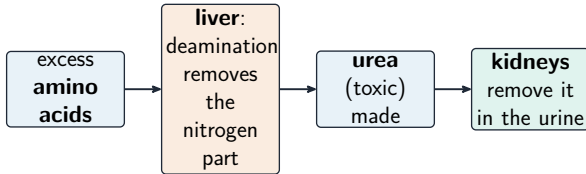
A **nephron** cleans the blood in two steps:

- **filtration** at the **glomerulus** – water, glucose, urea, ions out
- **reabsorption** – **all** glucose, **some** ions, **most** water back

What is left is urine.



The liver and urea



The **liver** breaks down excess **amino acids** by **deamination** , making **urea** .

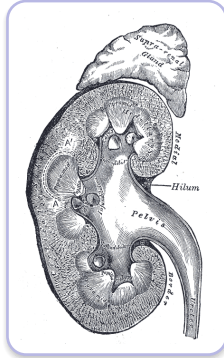
Urea is **toxic**, so the kidneys must excrete it before it builds up.

Dialysis



If the kidneys fail, a **dialysis** machine does their job. Blood flows through; waste & excess water cross a thin membrane; clean blood returns.

The urinary system



The kidneys filter the blood and make urine.

Inside the kidney

(Supplement) two regions

an outer **cortex** and an inner **medulla**

the **cortex**

holds the glomeruli and the convoluted tubules, where filtering and most reabsorption happen

the **medulla**

holds the loops of Henle and the collecting ducts, where water is concentrated

the **pelvis**

where urine collects before leaving down the ureter

the **nephron**

the working unit – about a million per kidney, spanning both regions

the **two steps**

ultrafiltration in the glomerulus, then **selective reabsorption** along the tubule

Filtration removes almost everything small; reabsorption takes back what the body wants. That order is why glucose appears in the filtrate but not in normal urine.

Exam tips

- Excretion removes metabolic wastes. Carbon dioxide leaves through the lungs; urea, excess water and excess ions leave through the kidneys.
- Urine path: kidney → ureter → bladder → urethra.
- Nephron: the glomerulus **filters** the blood; the nephron **reabsorbs** all the glucose, some ions and most of the water. What is left is urine.
- Urea is made in the **liver** from excess amino acids by **deamination**.
- We must excrete urea because it is **toxic** to the body.



Worked example – what the kidney does

Glucose is filtered out of the blood at the kidney, yet healthy urine has none. Explain.

- At the glomerulus, high pressure forces small molecules out: **ultrafiltration**.
- Water, glucose, salts and urea all cross; **blood cells and proteins are too big** to.
- So the filtrate **does** contain glucose at first.
- Further along the tubule, **all** the glucose is taken back into the blood: **selective reabsorption** .
- **Glucose in urine** therefore suggests diabetes – too much to reabsorb.

Two steps: **ultrafiltration** (by size, at the glomerulus) then **selective reabsorption** (useful things taken back). Urea is the **waste** that stays.

Topic 13 – key takeaways

1

Wastes

CO₂ via lungs; urea via kidneys

2

Urine path

kidney, ureter, bladder, urethra

3

Nephron

filter, then reabsorb glucose, ions, water

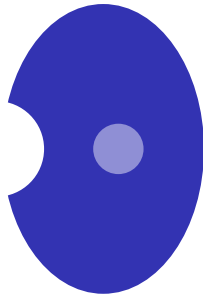
4

Urea

liver makes it by deamination; it is toxic

Check yourself

- 1 Which organ makes urea?
- 2 What happens at the glomerulus?
- 3 What does the nephron reabsorb all of?
- 4 Why must urea be excreted?



Answers 1. the liver 2. filtration of the blood 3. glucose 4. it is toxic if it builds up