

Excretion in humans

Revision notes · Excretion of carbon dioxide, urea, water and ions; the urinary system, the nephron, and the liver's role in forming urea.

For Cambridge IGCSE Biology 0610 (and 0970, which has the same content). **Supplement** is Extended content, only examined on Papers 2 and 4.

Excretion in humans Spec 13.1

Excretion, the lungs and the urinary system Spec 13.1.1, 13.1.2, 13.1.3, 13.1.4

Excretion is the removal of the waste products of metabolism and substances in excess of requirements. Waste products are made by the chemical reactions inside cells. If they build up, they can harm the body.

Carbon dioxide is made in cells during respiration. It is carried in the blood to the lungs and leaves the body when you breathe out. So the **lungs** excrete carbon dioxide.

The **kidneys** excrete urea and excess water and excess ions. These leave the body dissolved in urine.

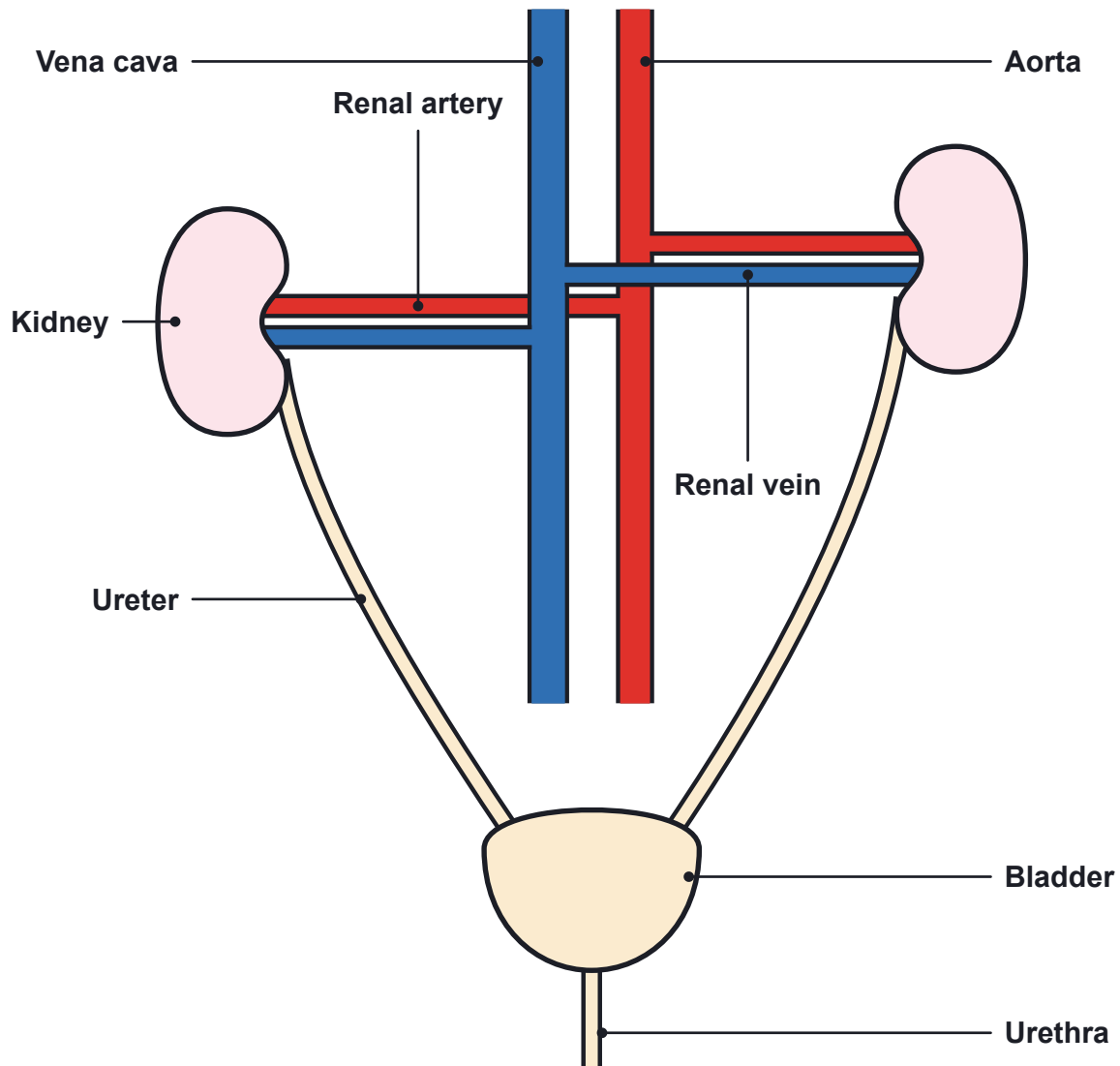
Excretory organs and the substances they excrete

Organ	Substances excreted
Lungs	Carbon dioxide
Kidneys	Urea, excess water and excess ions

The urinary system

Parts of the urinary system

Part	Function
Kidneys	Filter the blood and make urine
Renal artery	Brings blood to the kidney
Renal vein	Takes blood away from the kidney
Ureters	Tubes that carry urine from the kidneys to the bladder
Bladder	Stores urine
Urethra	Tube that carries urine out of the body



The **urinary system**. The renal artery brings blood to each kidney and the renal vein takes it away.

Common mistake: Do not mix up the ureter and the urethra. The ureter goes from the kidney to the bladder. The urethra goes from the bladder out of the body.

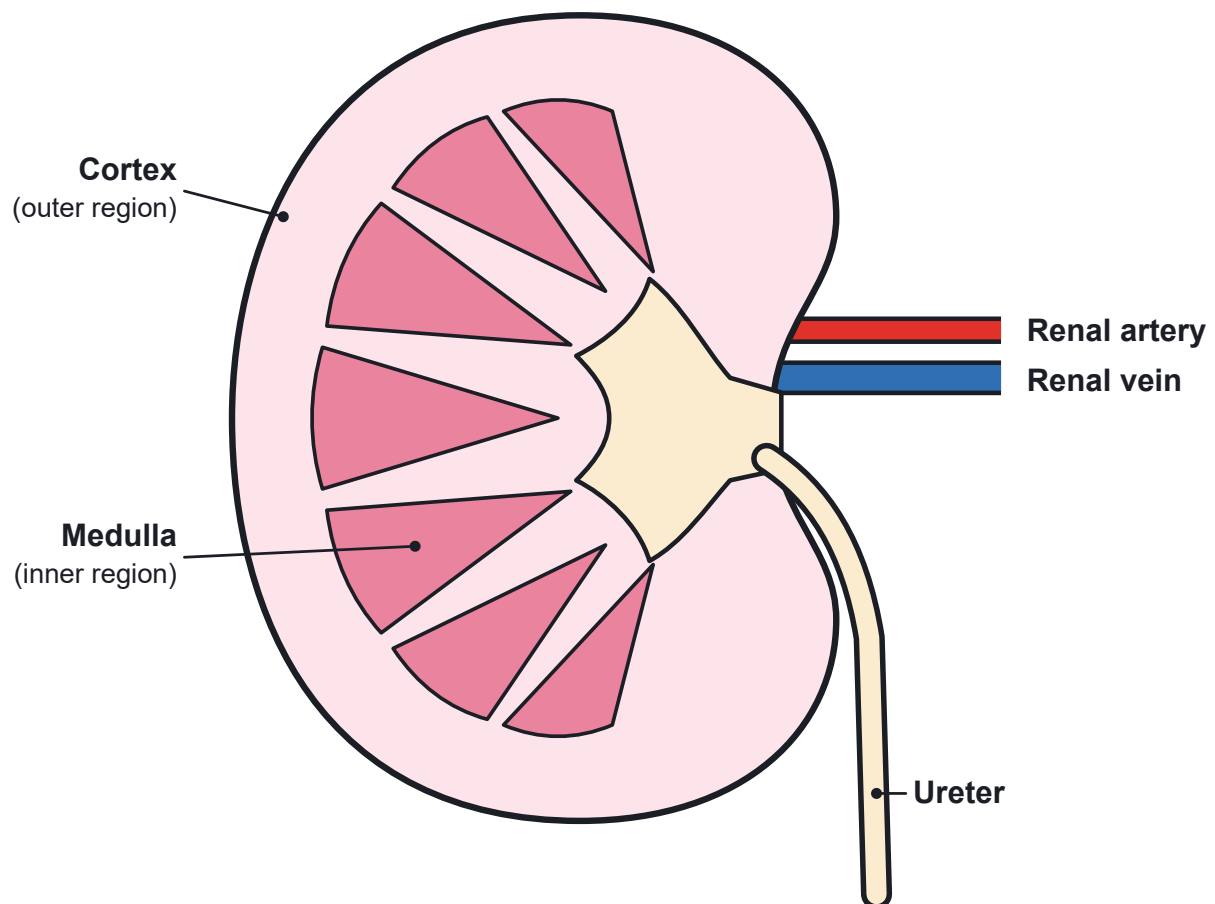
Supplement

Inside the kidney

Supplement

A section through a kidney shows two main regions. The **cortex** is the outer region. The **medulla** is the inner region. The ureter leaves the kidney, and the renal artery and renal vein join it.

Supplement



The **cortex** is the outer region of the kidney and the **medulla** is the inner region.

Supplement

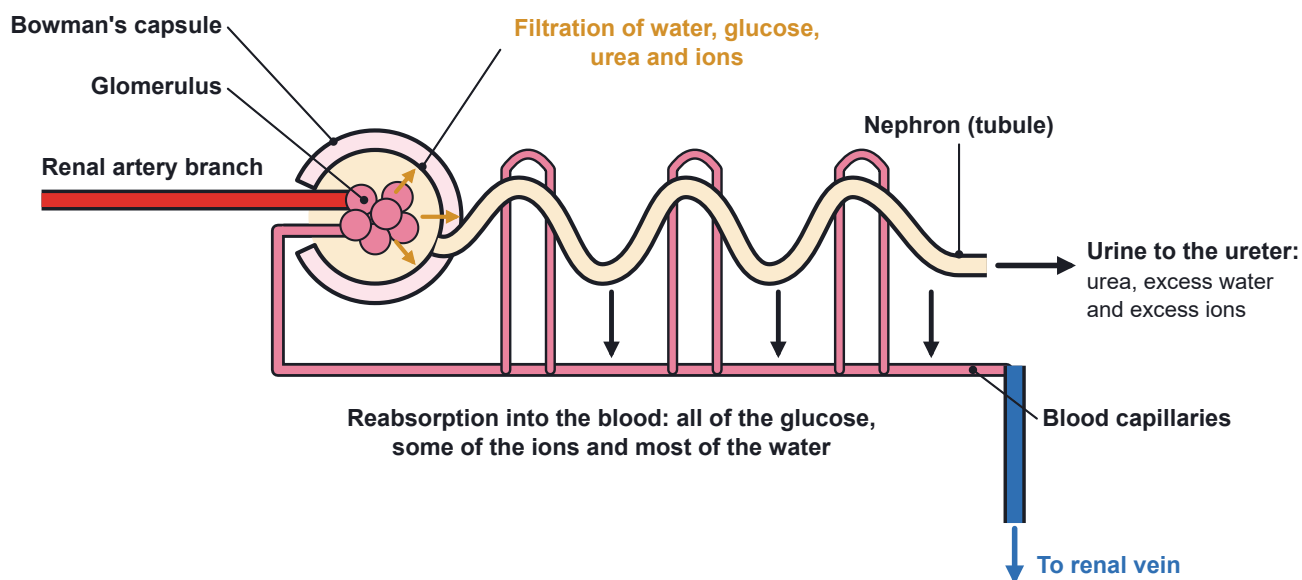
Exam tip: Cortex is the outer region and medulla is the inner region. In a diagram question, look at which region is on the outside.

The kidney and the nephron Spec 13.1.5 Supplement

Each kidney contains many tiny tubes called **nephrons**. A nephron filters the blood and forms urine. Blood enters a knot of capillaries called the **glomerulus**, which sits inside a cup-shaped Bowman's capsule. The glomerulus is supplied with blood by a branch of the renal artery.

1. **Filtration** (glomerulus): blood in the glomerulus is under high pressure. Water, glucose, urea and ions are forced out of the blood into the nephron. Large molecules such as proteins and blood cells stay in the blood.
2. **Reabsorption** (along the nephron): all of the glucose, some of the ions and most of the water are taken back into the blood.
3. **Urine formation**: what is left in the nephron is urine. It contains urea, excess water and excess ions. It flows to the ureter.

What happens to each substance			
Substance	Filtered at the glomerulus?	Reabsorbed into the blood?	In urine?
Water	Yes	Most of it	Yes, the excess
Glucose	Yes	All of it	No
Ions	Yes	Some of them	Yes, the excess
Urea	Yes	Some, but much stays in the nephron	Yes
Proteins and blood cells	No	Not applicable	No



Filtration at the glomerulus, reabsorption along the tubule, and what is left in the nephron is urine.

Exam tip: The syllabus asks for an outline only; you do not need the names of the other parts of the nephron. Learn the three ideas: filtration of water, glucose, urea and ions; reabsorption of all glucose, some ions and most water; urine containing urea, excess water and excess ions.

Common mistake: Glucose is filtered out of the blood, then all of it is taken back. Do not say glucose is not filtered. Proteins and blood cells are not filtered.

The liver, deamination and urea Spec 13.1.6, 13.1.7, 13.1.8, 13.1.9 Supplement

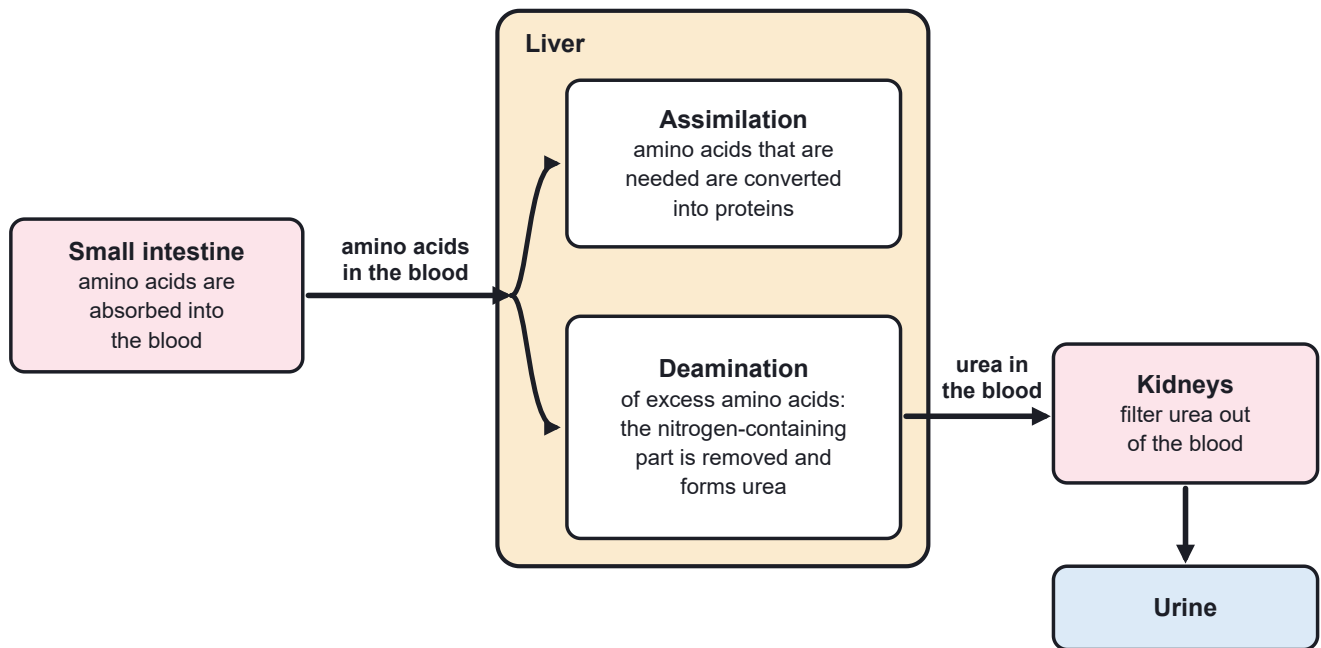
Assimilation of amino acids

Digestion breaks proteins down into amino acids, which are absorbed into the blood. The blood carries them to the liver. The liver takes up the amino acids it needs and converts them into proteins. This is the assimilation of amino acids.

Deamination and urea

The body does not need all of the amino acids it takes in. The excess amino acids are broken down in the liver. Deamination is the removal of the nitrogen-containing part of amino acids to form urea.

1. Amino acids that are in excess of requirements reach the liver.
2. The liver carries out deamination: the nitrogen-containing part of each amino acid is removed.
3. The nitrogen-containing part forms urea.
4. Urea passes into the blood and is carried to the kidneys.
5. The kidneys filter urea from the blood and it leaves the body in urine.



The liver converts the amino acids it needs into proteins and **deaminates** excess amino acids to form **urea**, which the kidneys excrete.

Why excretion of urea matters

Urea is **toxic**. If it were not removed, it would build up in the blood and body cells and cause harm. Excretion is important because it removes this toxic waste from the body.

Exam tip: If asked why urea must be excreted, say it is toxic (poisonous) and would build up. Do not say urea is harmless or safe.

Common mistake: Deamination happens in the liver, not the kidneys. The kidneys only remove the urea from the blood. Deamination is not digestion.

Quick check

1. Which organ excretes carbon dioxide?
2. Name the tube that carries urine from the bladder out of the body.
3. **Supplement** Name the two regions seen in a section through a kidney.
4. **Supplement** Which substance is all reabsorbed into the blood from the nephron?
5. **Supplement** Where is urea formed, and from what?

Quick check answers

Excretion in humans

1. The lungs.
2. The urethra.
3. The cortex (outer) and the medulla (inner).
4. Glucose.
5. In the liver, from excess amino acids.