

Biology Knowledge Organiser

B12 - Homeostasis in action

Controlling water and nitrogen balance in the body

Maintaining water levels in the body is essential for proper functioning of body cells. You must regularly 'top up' your water (by having a drink!), as it is constantly being lost from the body.

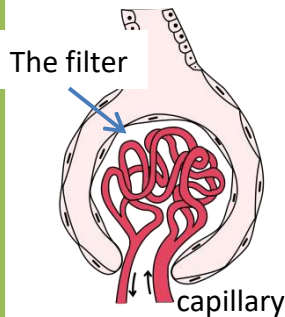
Water is lost in these ways:

- Water vapour is lost from the **lungs** when we exhale (breathe out)
- Water (along with ions and urea) is lost from the **skin** in sweat
- Water (along with ions and urea) is lost through the **kidneys** in urine.

We can't control the first two methods of water loss – you have to breathe and sweating is unavoidable (and varies according to temperature of the surroundings, of course). However, the amount of water lost in urine can be controlled – by the endocrine system. So, your body can remove excess water in the urine, or keep some water back by not putting so much in the urine.

Kidney function

Kidneys produce urine in two stages: by **filtration** of the blood then **selective reabsorption** of useful substances. Only small molecules can get through the filter (which is why there aren't any red blood cells in your urine). The kidney then **reabsorbs** (takes back in) the substances you need – **all** the glucose, many of the ions and most of the water.



Key Terms	Definitions
Urea	A chemical that must be removed from the body, as it is mildly toxic. It is produced in the liver from excess (too much) amino acids. Urea contains nitrogen.
Urine	Wee! Urine contains water (in variable amounts), ions and, most importantly, urea. Urine is produced in the kidneys.
Excretion	Any process that <u>removes</u> substances from the body.
Filtration	In the kidney, filtration of the blood means large particles/cells/molecules remain in the blood (e.g. red blood cells) and small molecules go through the filter (e.g. water, ions, glucose, urea).
Reabsorption	In the kidney, many substances are taken back into the blood even though they were just filtered out. 100% of glucose is reabsorbed (unless someone has diabetes) and most of the water and ions.

HT: urea formation and hormonal control of water level

Urea is a product made in the liver. The digestion of proteins (from the diet) results in excess amino acids which need to be excreted safely. The liver removes the amino part of the amino acids (NH_3) – a process called **deamination**. The **ammonia** produced is toxic so it is immediately converted to **urea** in the liver cells, which is far less harmful. The urea enters the bloodstream so it can be filtered out in the kidneys.

ADH is the hormone that controls water level in the body. It is released by the pituitary gland when the water level drops (the blood is too concentrated). The target organ for ADH is the kidney – ADH causes the kidneys to reabsorb more water into the blood, so the water level increases again. The release of ADH is controlled by negative feedback.