Role of Kidney in Homeostasis- Biology only

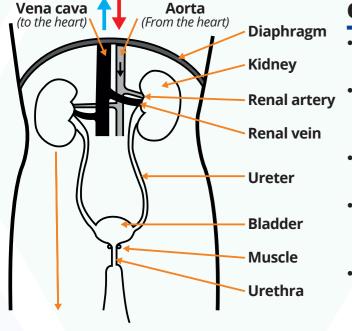
The Excretory System - Removes urea a waste product of metabolism and regulates the water content of the blood.

The Nephron-Higher tier only

The afferent arteriole

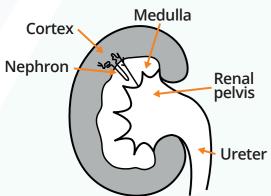
brings blood to the

nephron.



Inside the kidney

Kidney Failure



There are about a million nephrons in each kidney. They filter the blood.

- **Cleaning the blood**
- Blood from the aorta moves into the renal artery and into the kidney.
- The kidney filters the blood and removes some water, urea and excess salts.
- Cleaned blood returns to the heart in the vena cava.
- The filtrate called urine leaves the kidneys in the ureters and is stored in the bladder.
- Urine is passed out of the body through the urethra.

Detecting disease

- Red blood cells in urine indicates kidney damage or disease.
- Glucose in the urine can indicate diabetes.

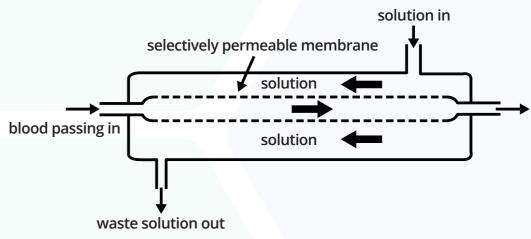
The solution remaining in the tubule, urine, collects in the collecting ducts and this leads to the ureter.

The collecting duct is under the control of a hormone ADH, this controls how much water can move back into the blood by osmosis.

Treatments	Advantages	Disadvantages
Dialysis	Immediately available.	A long time spent in hospital attached to a dialysis machine every week and diet is restricted.
Transplant	Can last 12-15 years with minimal medical intervention.	Immunosuppressant drugs must be taken to avoid rejection.
		A donor must be found and must have a similar tissue type to the recipient, so a close family living donor is preferable.

How dialysis works- Higher tier only - blood is removed from the body and flows through tubing made from a selectively permeable membrane.

Dialysis fluid contains equal concentration of glucose and salts that should not be removed from the blood. It contains no urea and so urea will diffuse from a high concentration in the blood out into the dialysis fluid which is then disposed of.





Efferent arteriole, narrower than the afferent, creating pressure in the capillary knot.

Capillary knot.

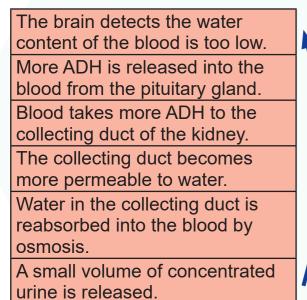
In the tubule all the glucose and some of the water and salts are reabsorbed into the blood capillaries that wrap around it. Bowman's capsulefiltration under pressure occurs here. Glucose, urea, salts and water are forced out of the blood and into the capsule.

> Dialysis fluid and blood will flow counter current to each other to maintain a concentration gradient for diffusion of urea across the whole membrane.

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Control of water in the blood by Antidiuretic hormone (ADH)

The brain monitors the water content of the blood as shown below:



The brain detects the water content of the blood is too high. Less ADH is released into the blood from the pituitary gland. Blood takes less ADH to the collecting duct of the kidney. The collecting duct becomes less permeable to water. Water is retained in the collecting duct.

A large volume of dilute urine is released.

This process operates by negative feedback.

