

## Student worksheet 2: kidneys and dialysis

The human kidney is an amazing organ, with two essential functions: the maintenance of water balance in the body, and the excretion of urea, salts and water. Each day, the kidneys filter 180 l of fluid out of the blood – most of which is reabsorbed, together with all the nutrients that the body still needs, such as glucose and amino acids. From the 180 l of fluid that they filter, the kidneys produce about 2 l of urine containing waste products such as urea, which is toxic to the body. The urine is then stored in the bladder before being excreted.

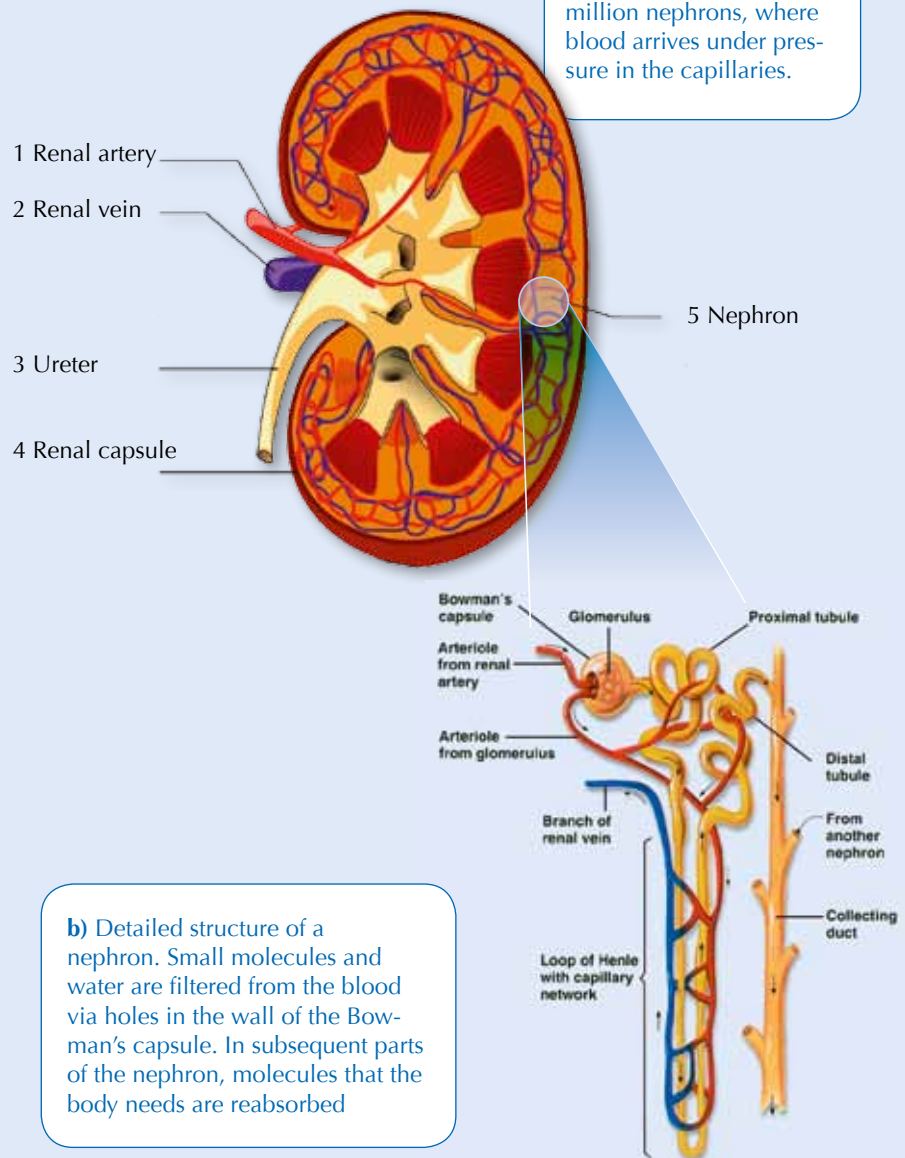
1. Why do you think there are normally no plasma proteins in the urine even though they are in solution in the blood plasma?
2. As a result of certain injuries or diseases, blood cells appear in the urine. What may have happened to cause this?

If a person's kidneys fail, death will follow in about four days because urea builds up and the body loses control of its water balance. The person's life may be saved with the help of *dialysis*; this typically involves attending hospital three times a week. During dialysis, which takes about six to eight hours, the blood is taken from the patient's body in a tube and flows into a machine where it passes next to a filter called a dialysis membrane. A specialised dialysis solution flows on the other side of the membrane. The composition of this solution ensures



A patient undergoing dialysis

### How the kidney works



that urea passes through the membrane from the blood into the dialysis fluid, but glucose and amino acids do not. The blood – minus urea – is then returned to the body.

1. Why are red blood cells and plasma proteins not removed from blood during dialysis?
2. Urea, glucose and amino acids are similar-sized molecules. Why does urea pass across the dialysis membrane but glucose and amino acids do not?
3. What would happen if water were used as the dialysis fluid?
4. How could dialysis be used to remove excess salts?