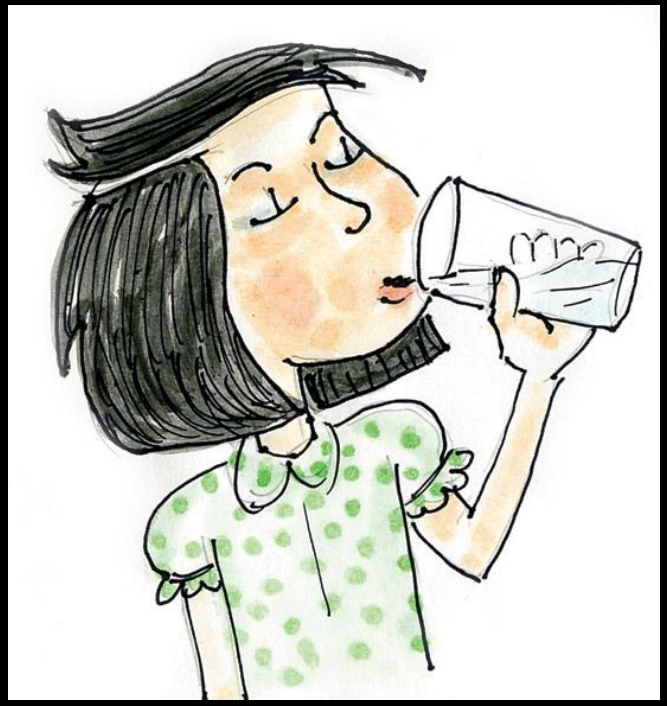
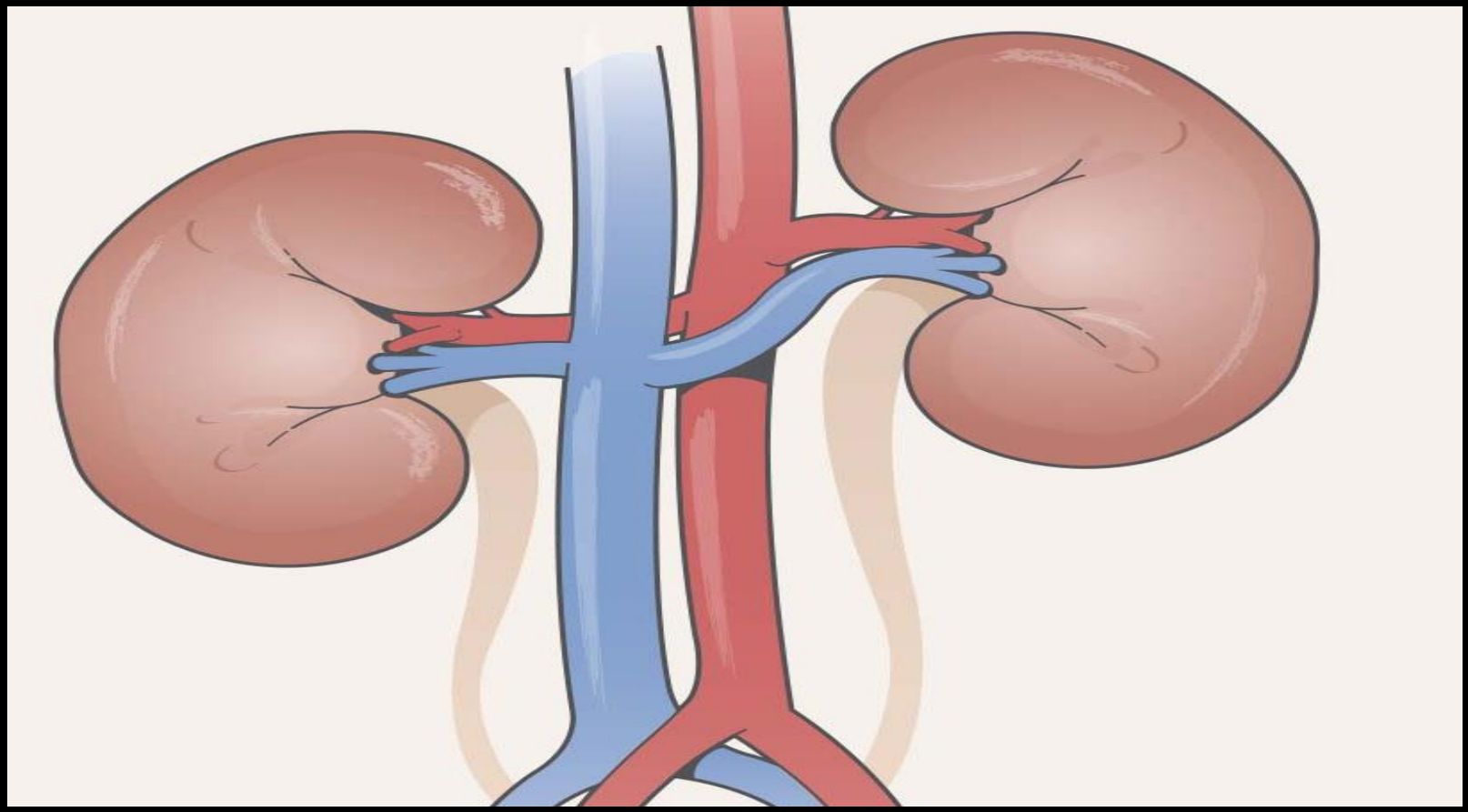
Excretion and Regulating Water/Osmotic Balance



Chapter 13 pp 256 (Text book)

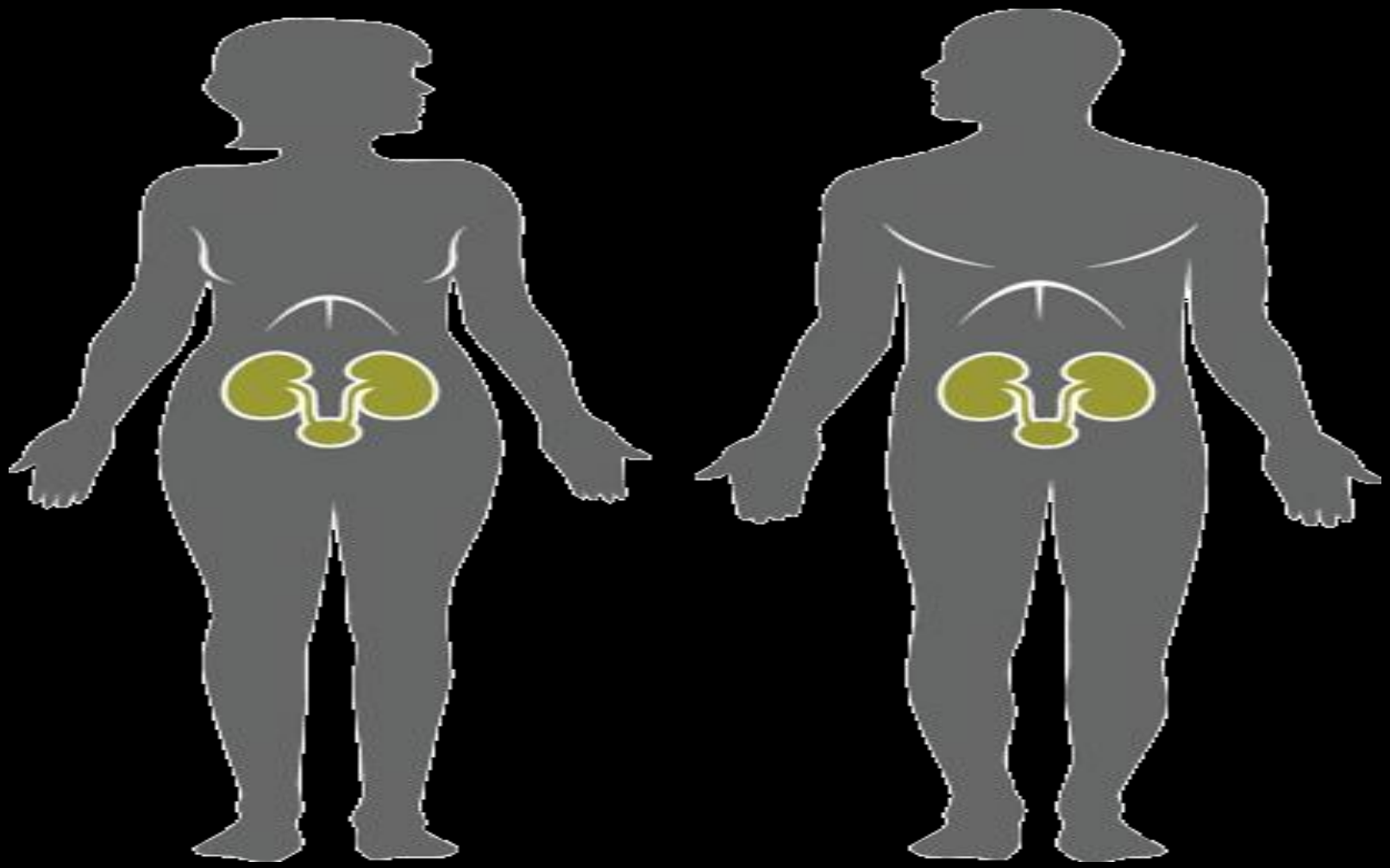
Chapter 24 pp 550 (Ref Book)

The filtering machine



It filters your blood 300 times a day

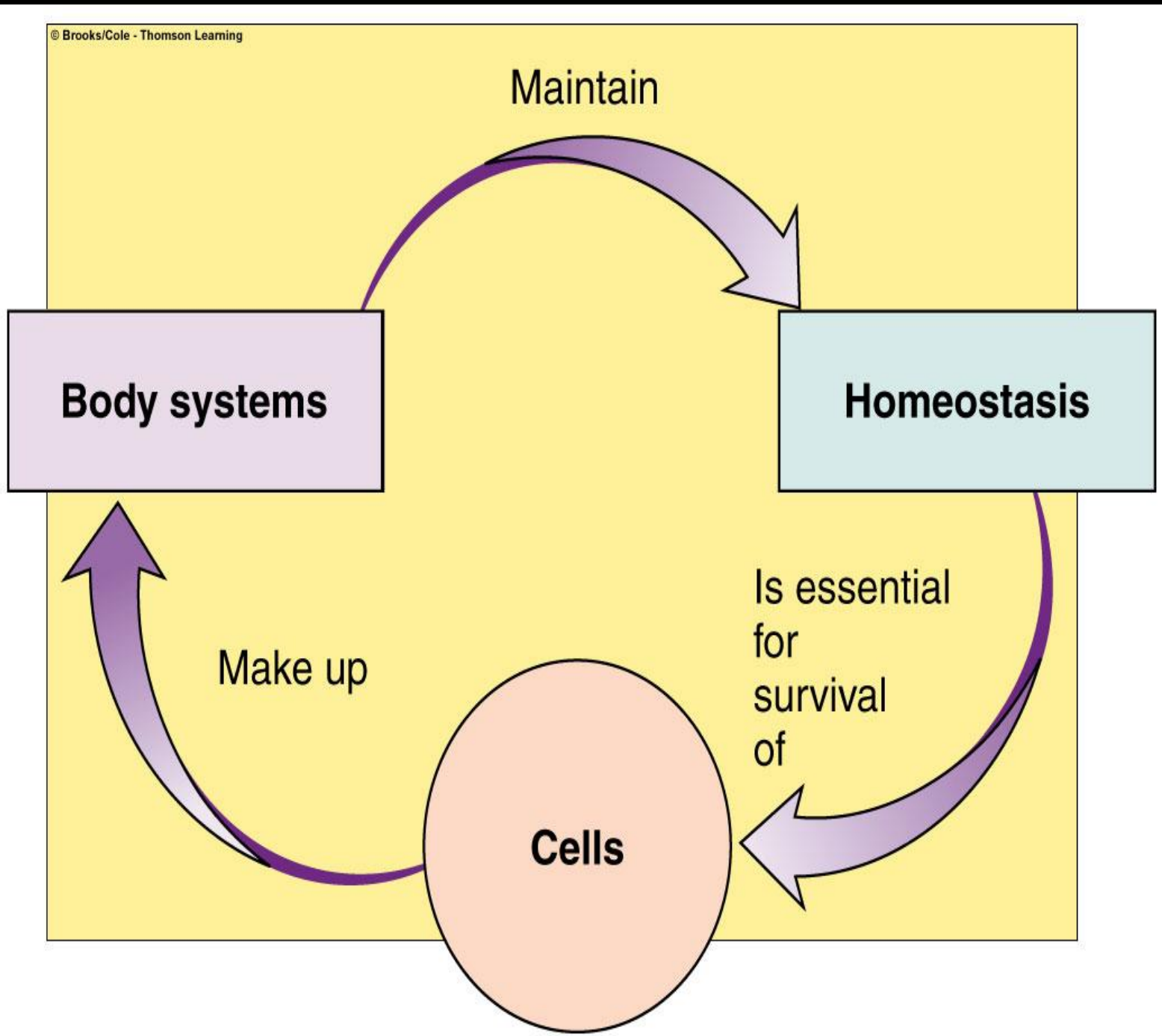
These are quality organs. They work day and night to keep us alive



But when one of those organs is distressed, we are in crisis…

The animal body self-regulates

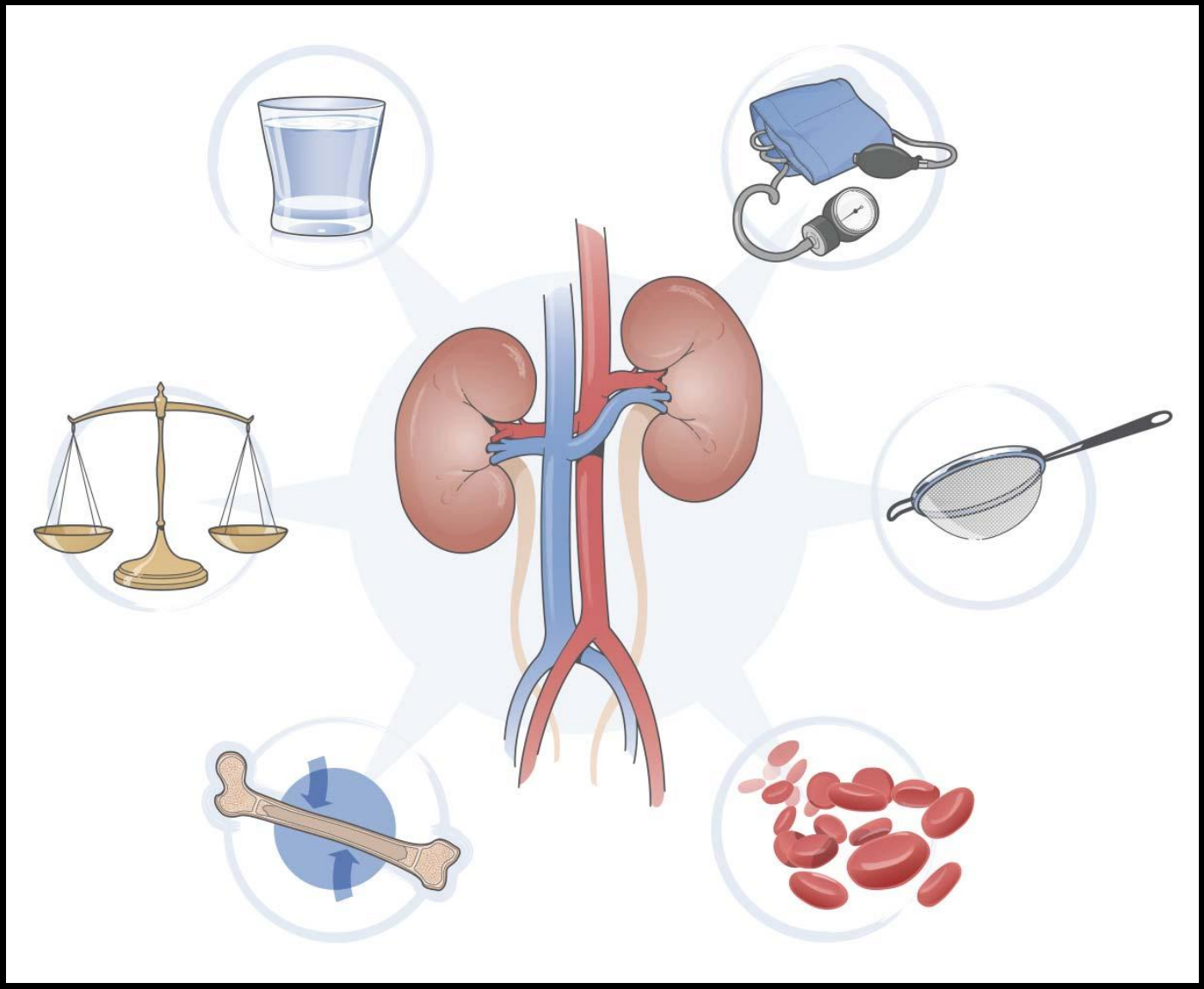
When you play or work out hard, your muscles produce a lot of heat that in turn increases your overall internal temperature


© Brooks/Cole - Thomson Learning
Maintain
Body systems
Homeostasis
Is essential for survival of
Make up
Cells

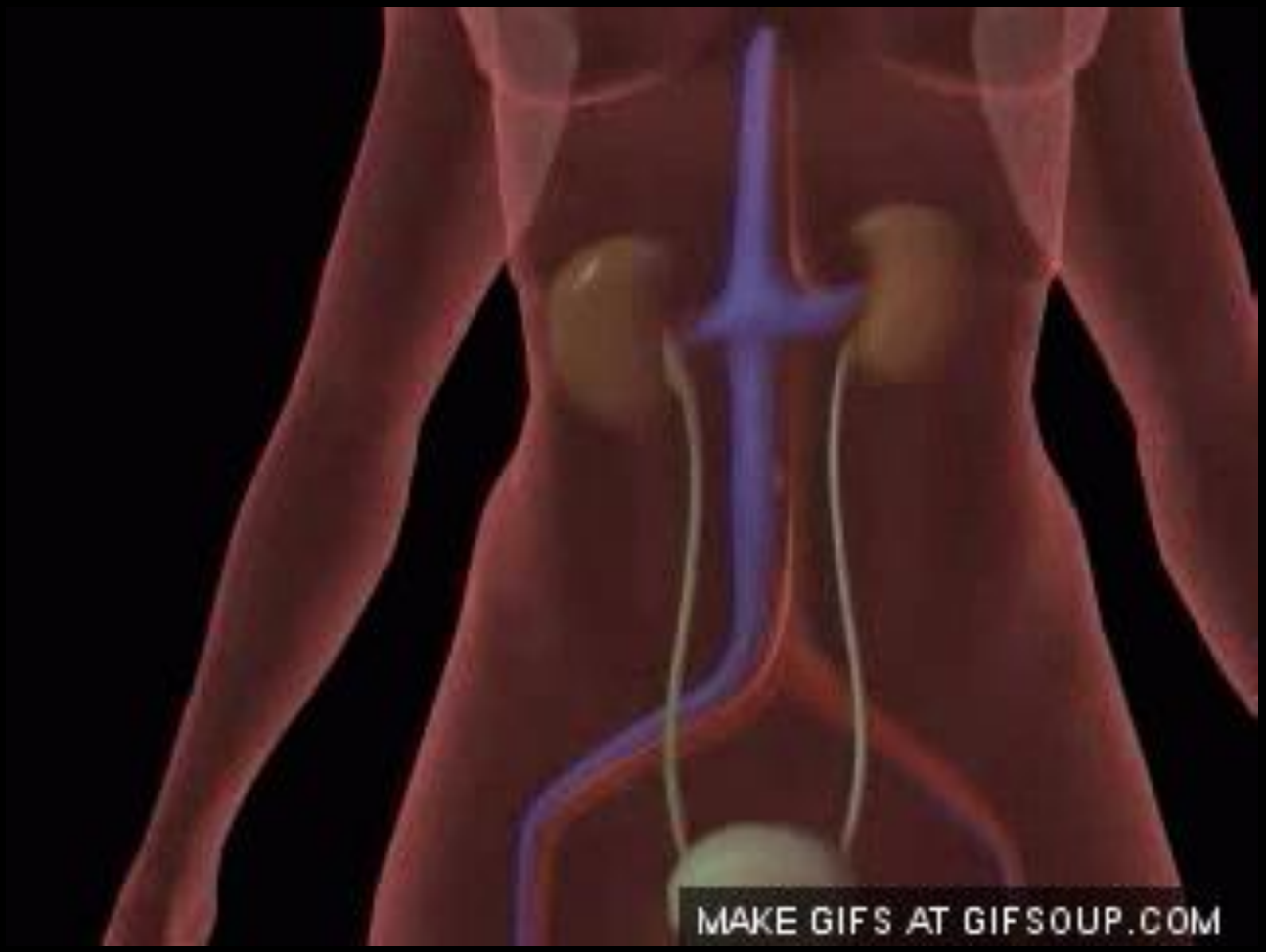
What is Osmo-regulation?

Osmo-regulation is an active physiological process by which an organism maintains water balance; that is, to compensate for water loss, avoid excess water gain, and maintain the proper osmotic concentration of the body fluids.

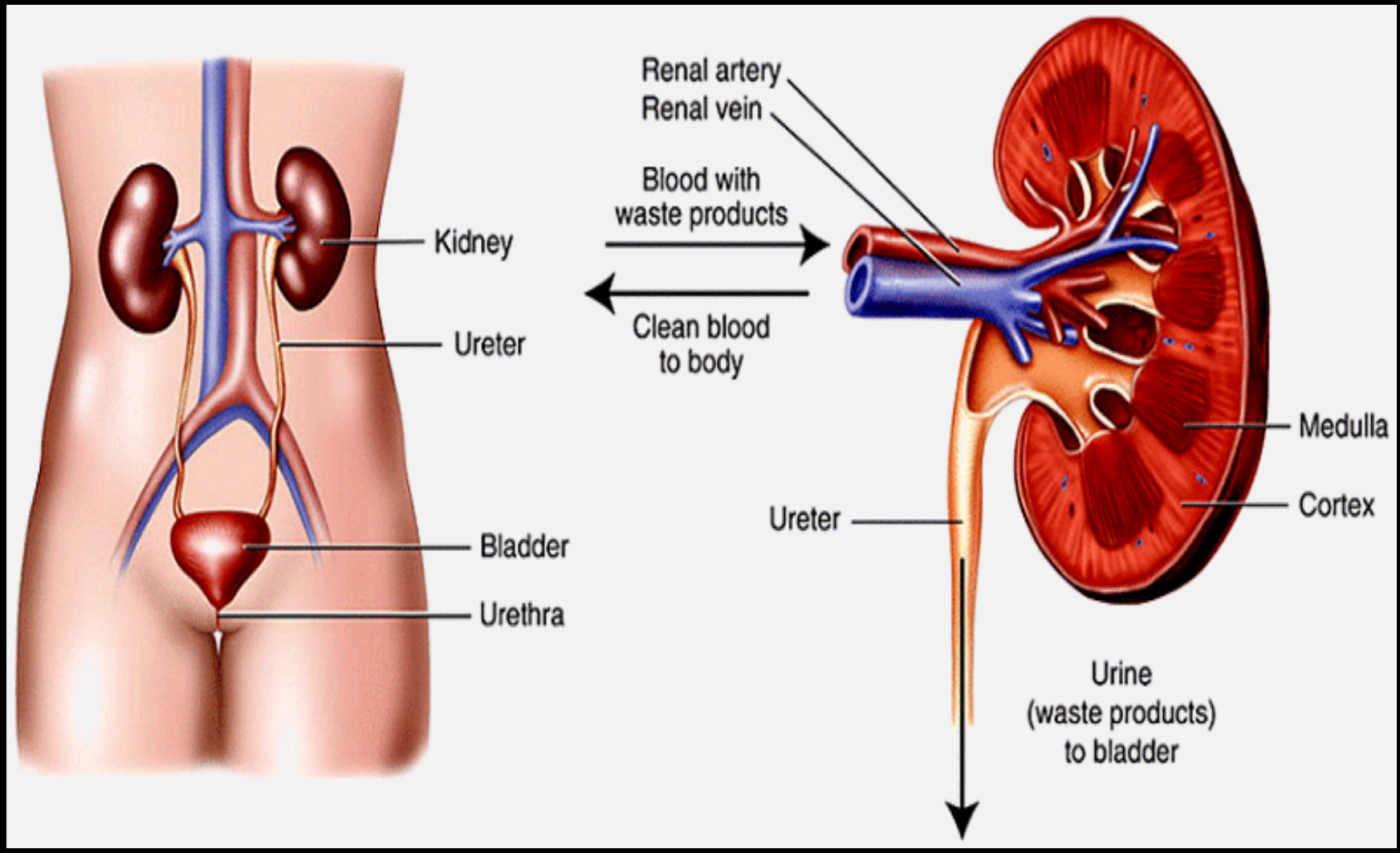
Can you Guess the Kidney functions?



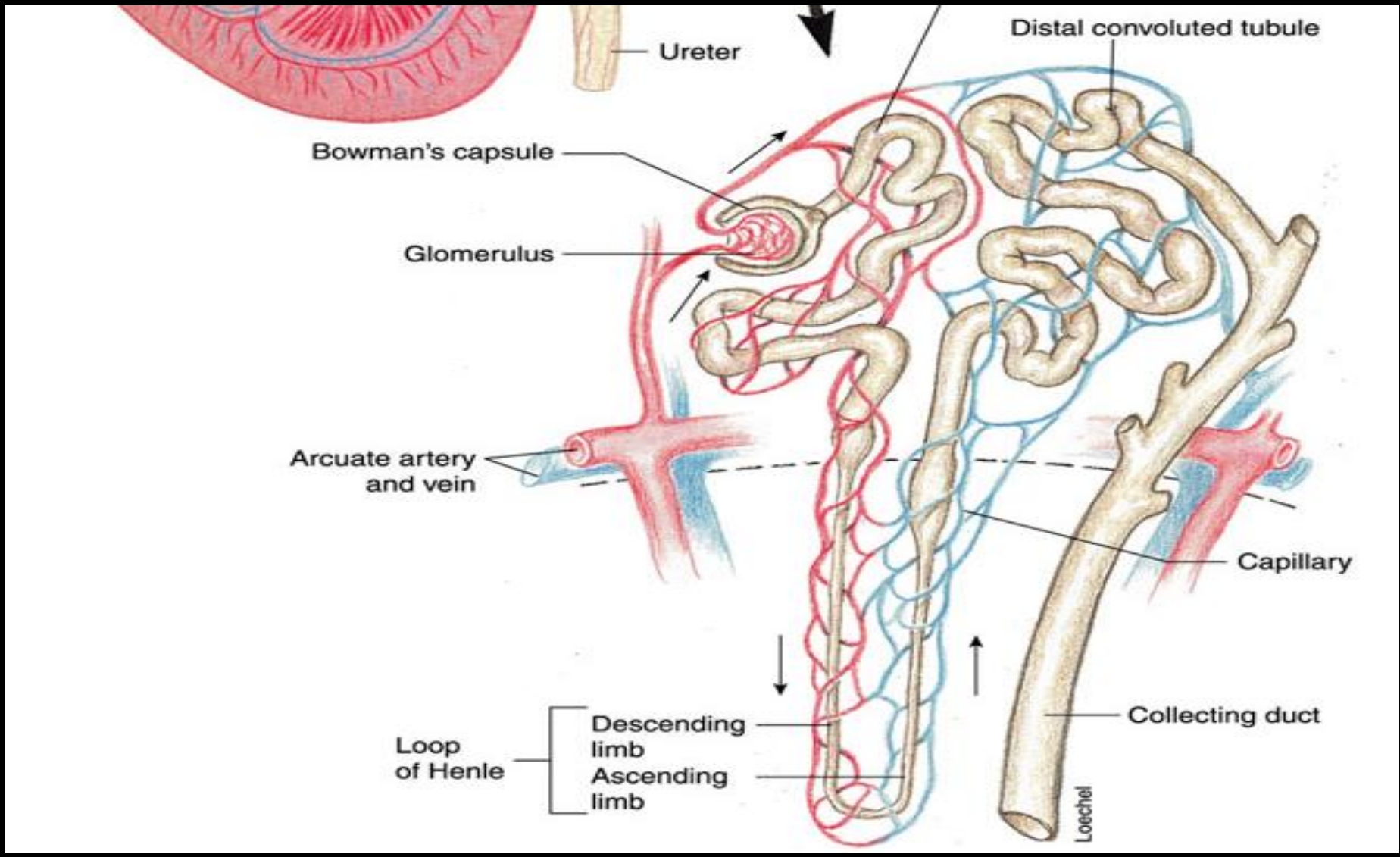
The Excretory System

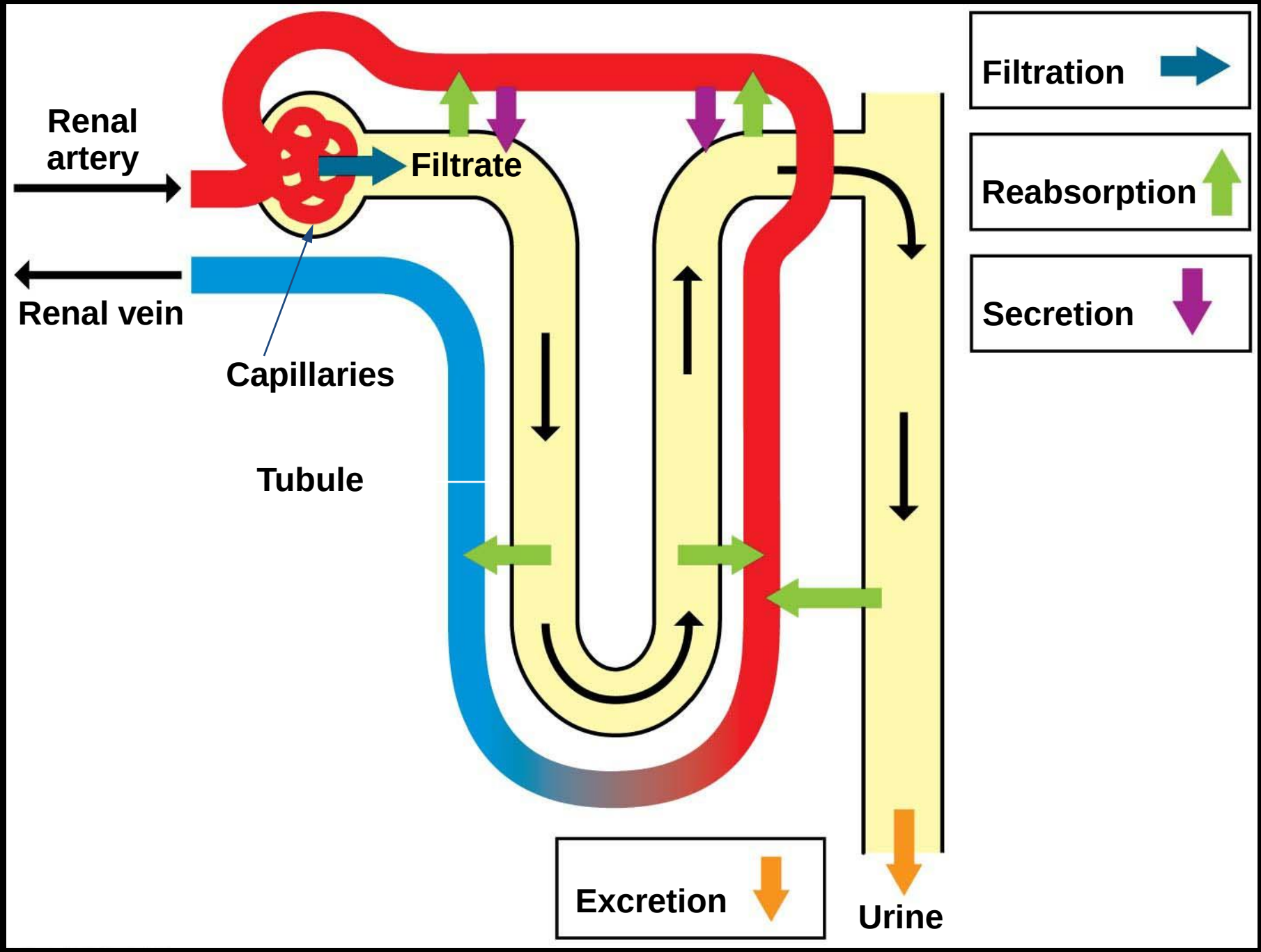


The Kidneys


Kidney
Ureter
Bladder
Urethra
Renal artery
Renal vein
Blood with waste products
Clean blood to body
Medulla
Cortex
Ureter
Urine (waste products) to bladder

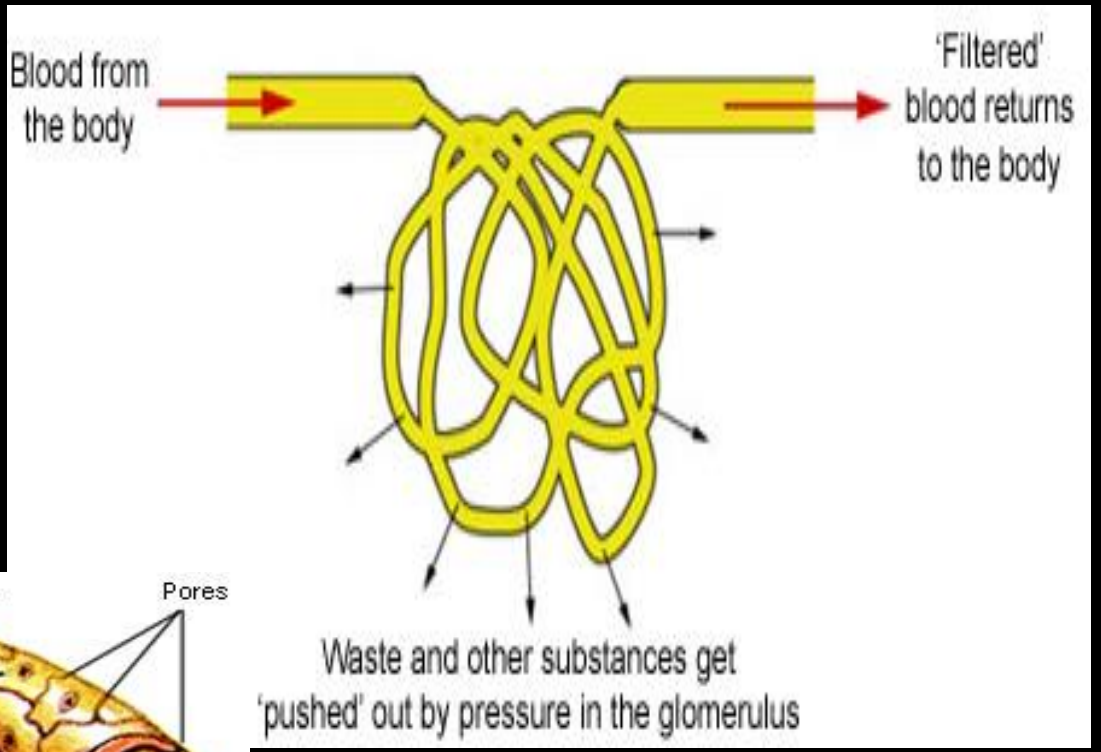
Let's see the Filtering Units: Nephrons

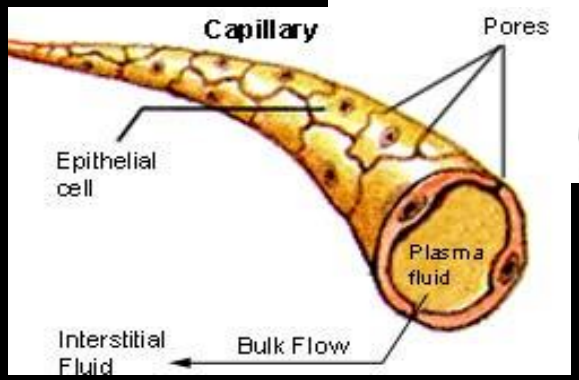



Renal artery
Filtrate
Renal vein
Capillaries
Tubule
Filtration
Reabsorption
Secretion
Excretion
Urine

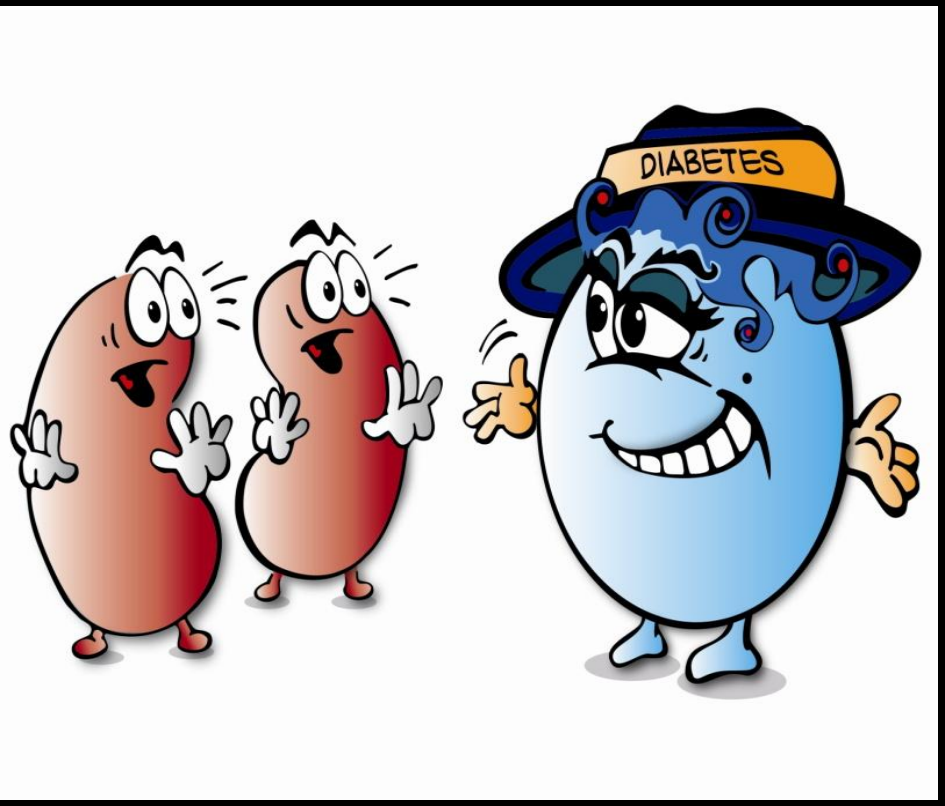
Step-1 Urine Formation

- Major activities in kidney
  - **Filtration**
    - Glomerular capillaries are porous.





Glucose, amino acids, ions, and water are pushed through the pores into the nephron tubules



The above can affect filtration?

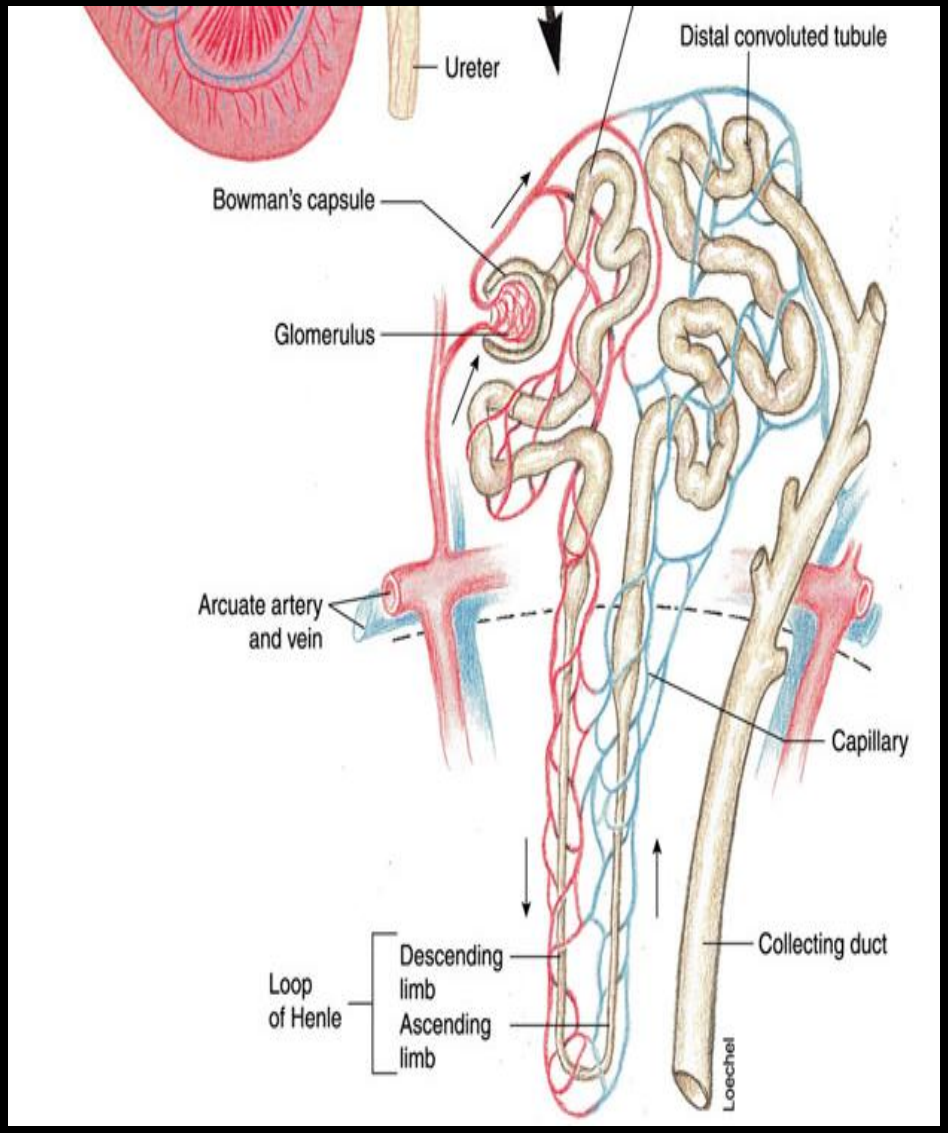
What has been filtered and what is not?

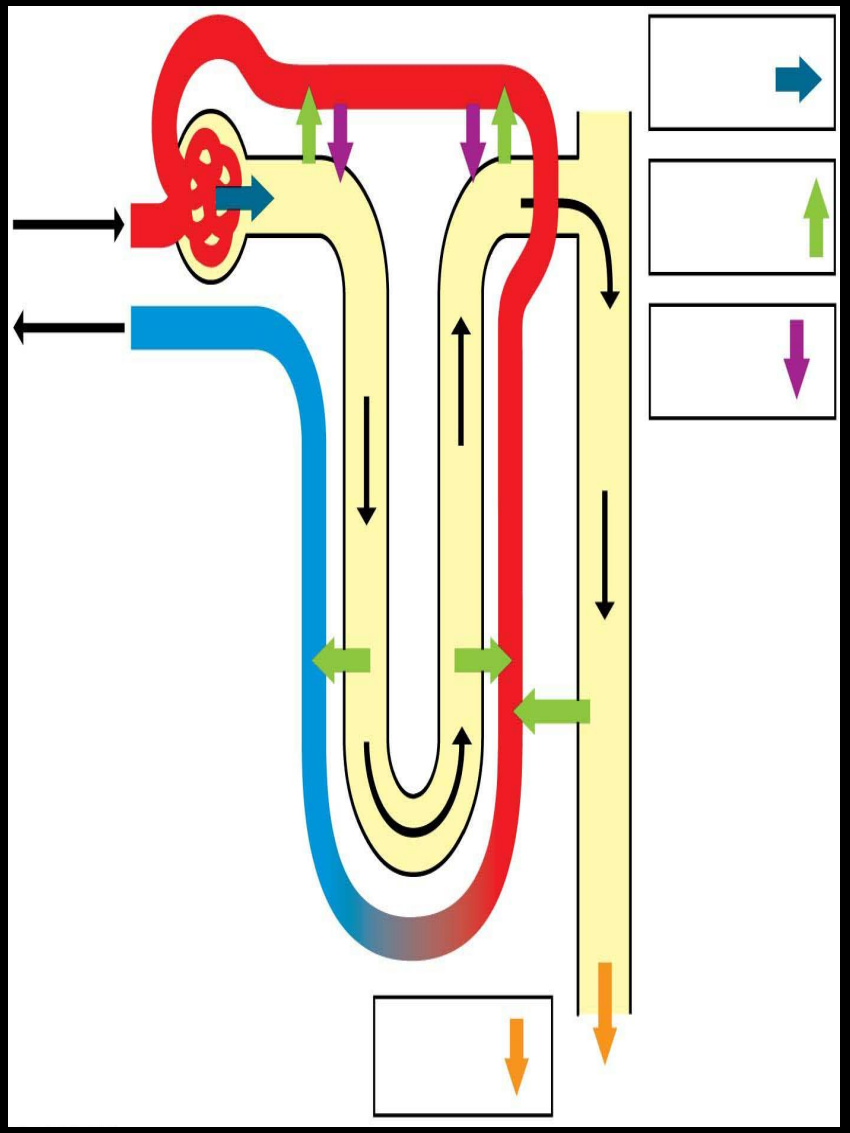
Step- 2 Urine Formation

- **Re-absorption (in PCT)**
  - Useful molecules **<u>reabsorbed</u>** into capillaries around the nephron (**Water, Amino acids, Glucose, Sodium**)

- Water reabsorption from Loop of Henle. Occurs because of osmotic gradients ***Concentrates urine, conserves water***

Re-absorbed where?

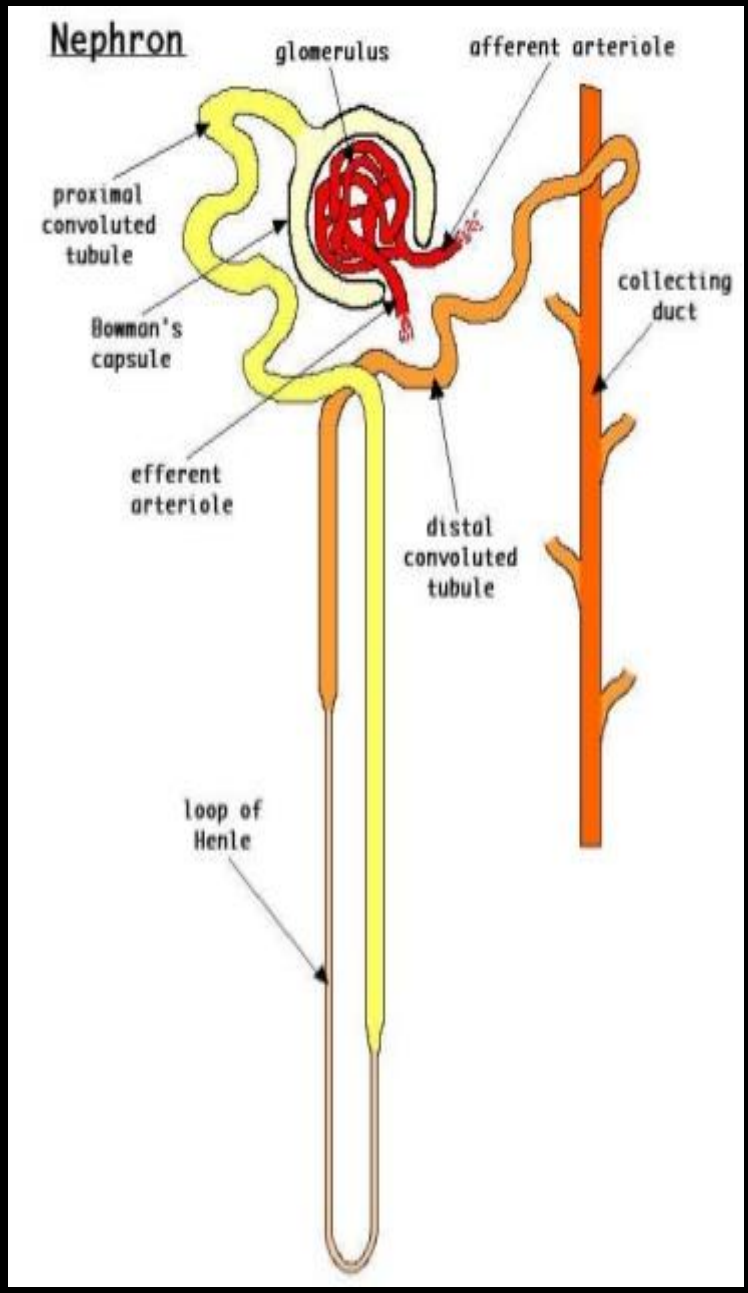




The kidneys reabsorb 99.9% of the fluid filtered….

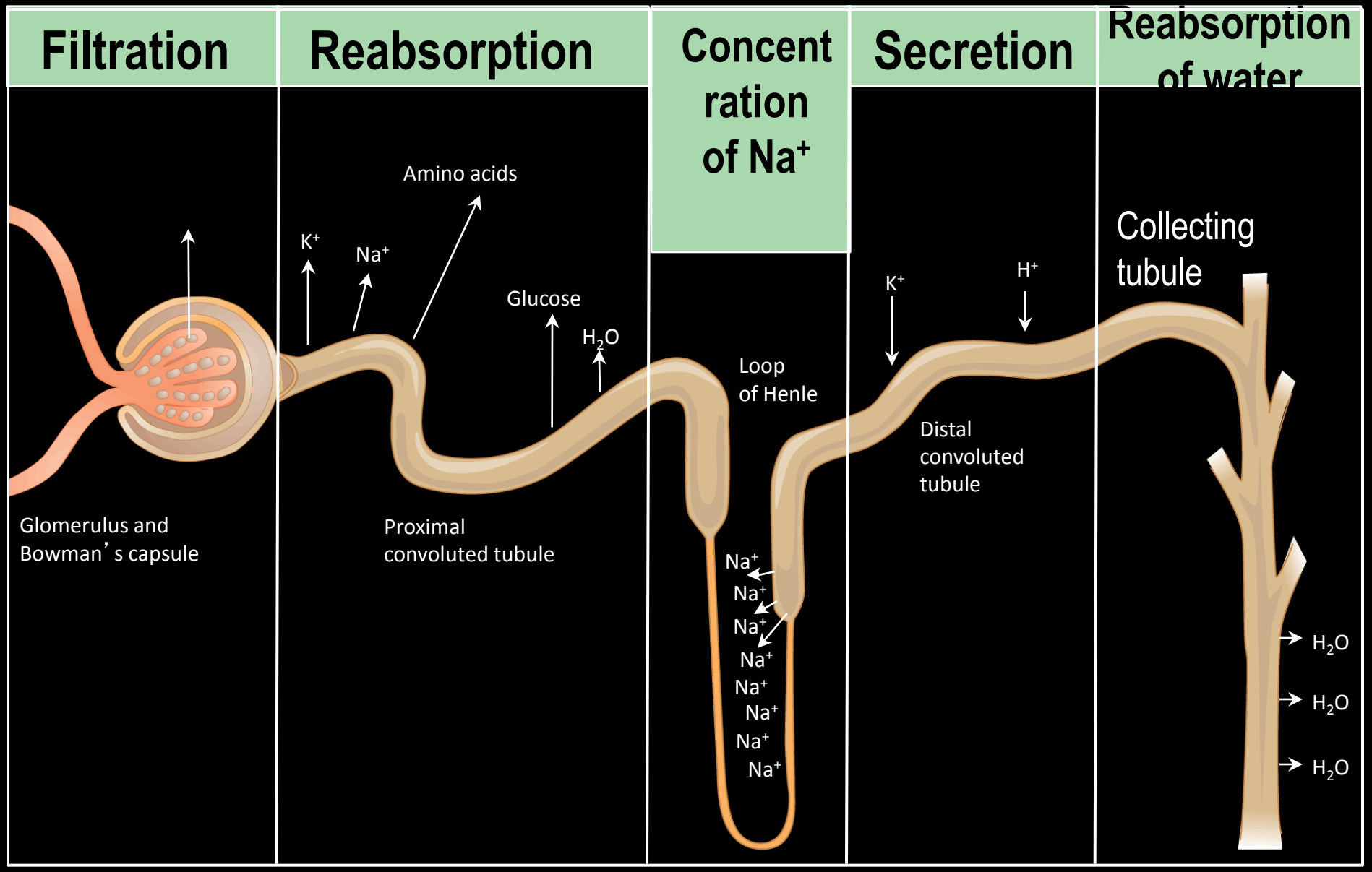
The PCT normally re-absorbs 60-70% of the volume of the filtrate.

Of total energy spent by kidneys, 80% is used for Na^+ transport (Why Imp?)



Can your urine sample tell whether you have a kidney dysfunction or diet abnormality?

	Amount Filtered	Amount Reabsorbed	Amount Excreted	% of Filtered Load Reabs
Glucose (g/day)	180	180	0	100
Bicarbonate (mEq/day)	4,320	4,318	2	>99.9
Sodium (mEq/day)	25,560	25,410	150	99.4
Chloride (mEq/day)	19,440	19,260	180	99.1
Potassium (mEq/day)	756	664	92	87.8
Urea (g/day)	46.8	23.4	23.4	50
Creatinine (g/day)	1.8	0	1.8	0


Filtration
Reabsorption
Concentration of Na+
Secretion
Reabsorption of water
Amino acids
K+
Na+
Glucose
H2O
Loop of Henle
K+
H+
Collecting tubule
Glomerulus and Bowman's capsule
Proximal convoluted tubule
Distal convoluted tubule
Na+
Na+
Na+
Na+
Na+
Na+
Na+
Na+
H2O
H2O
H2O

Role of Anti-diuretic Hormone (ADH) in Water Conservation