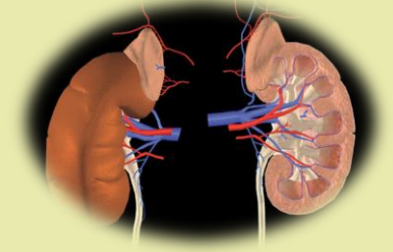


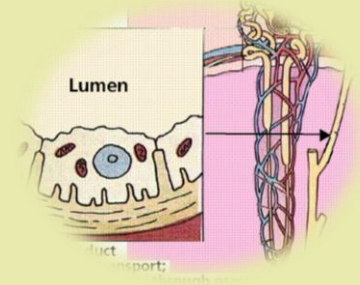
## 3.4.6 The Excretory System in the Human

Objectives – What you will need to know from this section



- Explain the role of the excretory system in homeostasis -- the ability and necessity to maintain constancy of body temperature, fluid balance and chemistry.

- State the function, location, products of the skin/lungs/urinary system.



- Refer to the different methods of temperature regulation in animals -- Ectotherms and Endotherms

- Explain temperature regulation in humans.

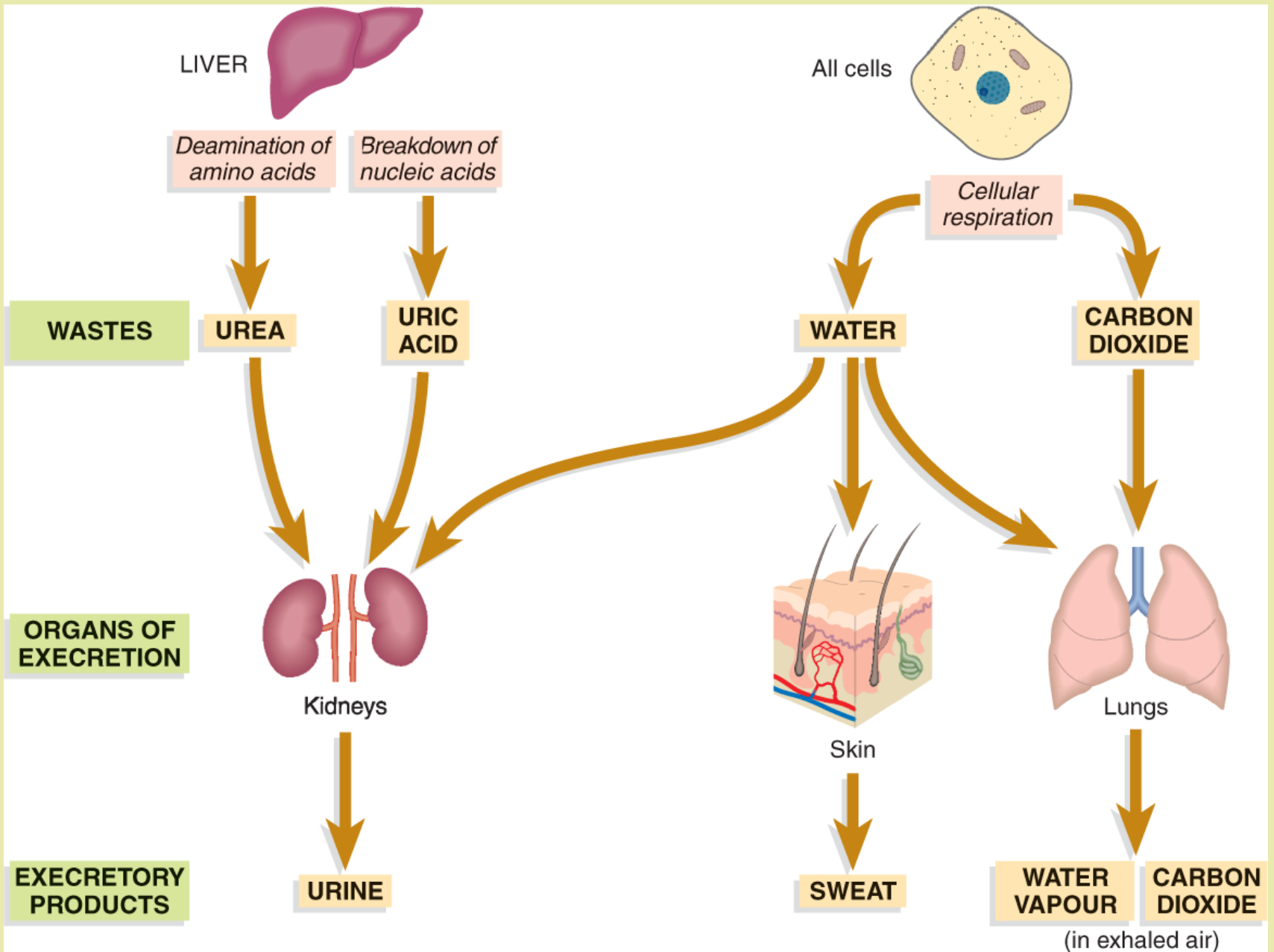


- Outline the basic macrostructure & function for urinary excretory system -  
Kidney/Ureters/Urinary Bladder/Urethra
- Explain the role of Kidney in regulating body fluids.
- Describe the processes of filtration ,  
reabsorption and secretion in the medulla &  
renal pelvis.
- Describe pathway of urine from kidney to  
urethra

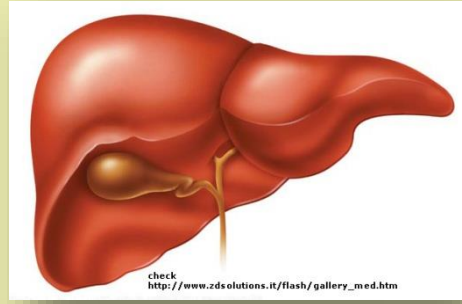
### 3.4.6 The Excretory System in the Human

- Excretion is the removal of waste products of metabolism from the body.
- The excretory system plays a role in homeostasis:
  - (i) by maintaining the composition of an organism's fluids, including fluid balance and chemistry.
  - (ii) by preventing the accumulation of poisonous wastes which might interfere with metabolism.
- **Homeostasis is the maintenance of a constant internal environment within the body.**

# OUR EXCRETORY SYSTEM

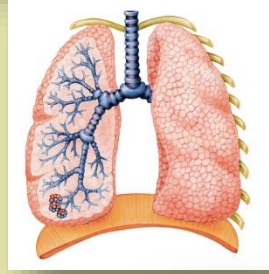


➤ The main waste products are water, carbon dioxide and nitrogenous (nitrogen-containing) wastes.

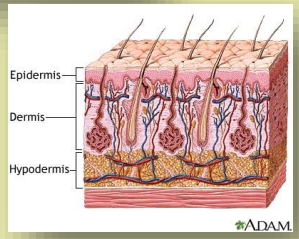


➤ In the liver, excess amino acids are split into a carbohydrate and urea.

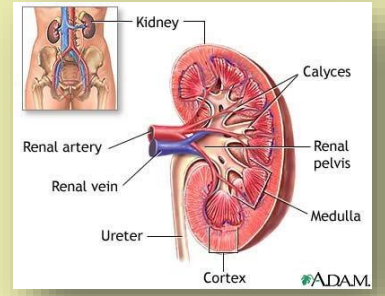
➤ The lungs remove carbon dioxide and water.



➤ The sweat glands excrete water and some salts.



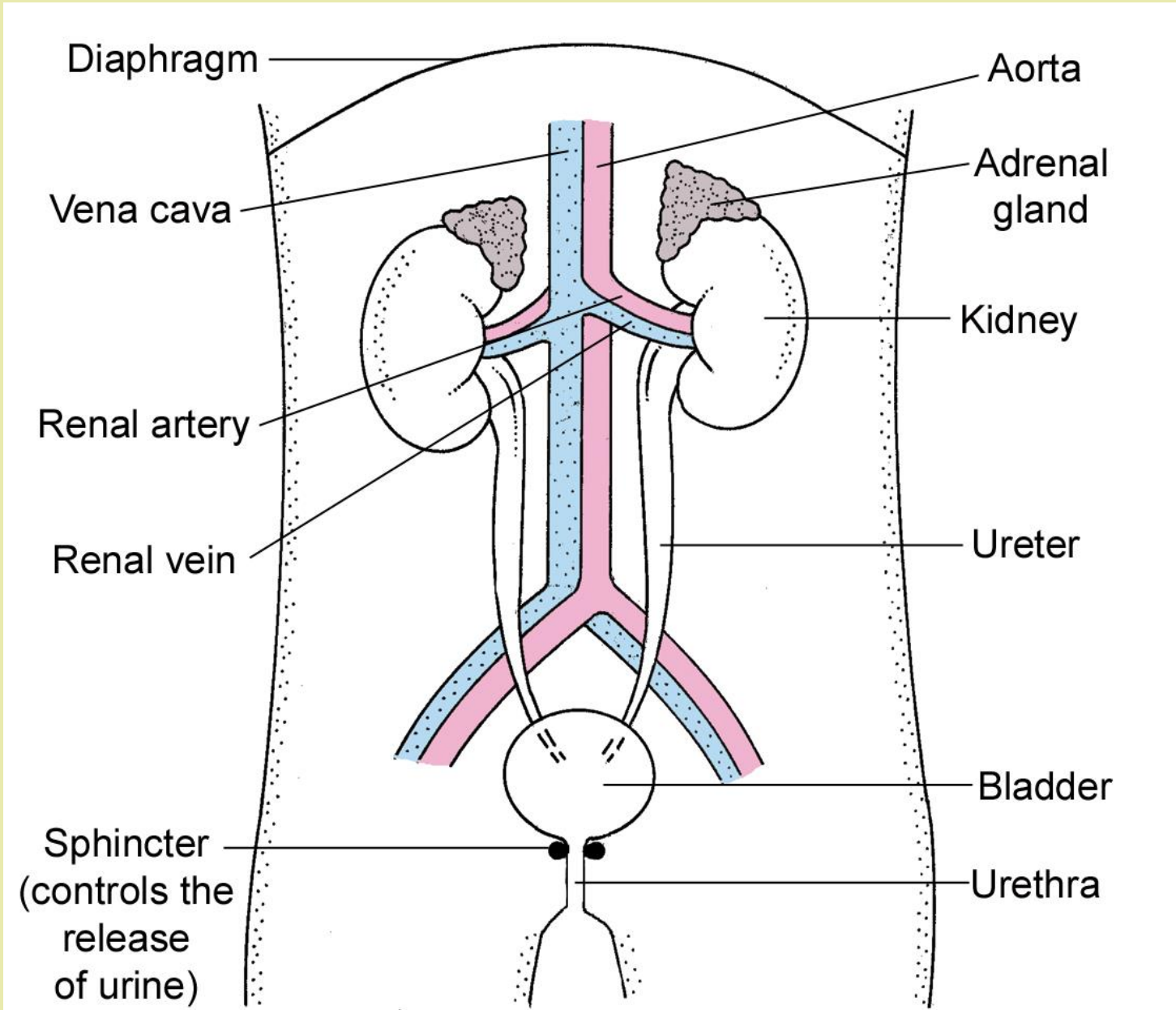
➤ The kidneys remove most of the rest, including the urea.



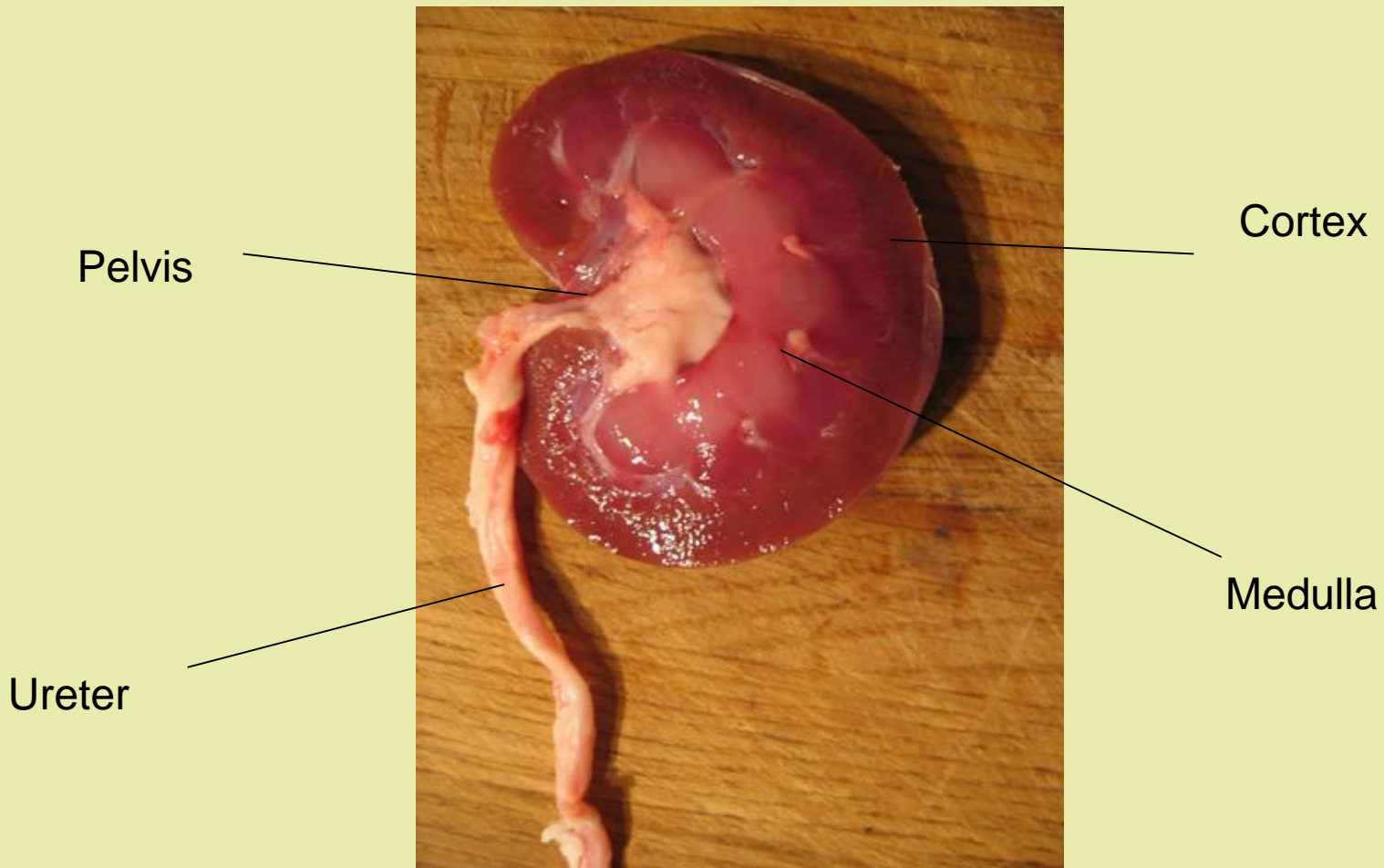
# LEARNING CHECK

- What is excretion?
- What role does excretion play in homeostasis in the body?
- Name the main waste products of the body.
- Name the main excretory organs of the body.

➤ The urinary system consists of the kidneys, the bladder and some ducts (tubes).



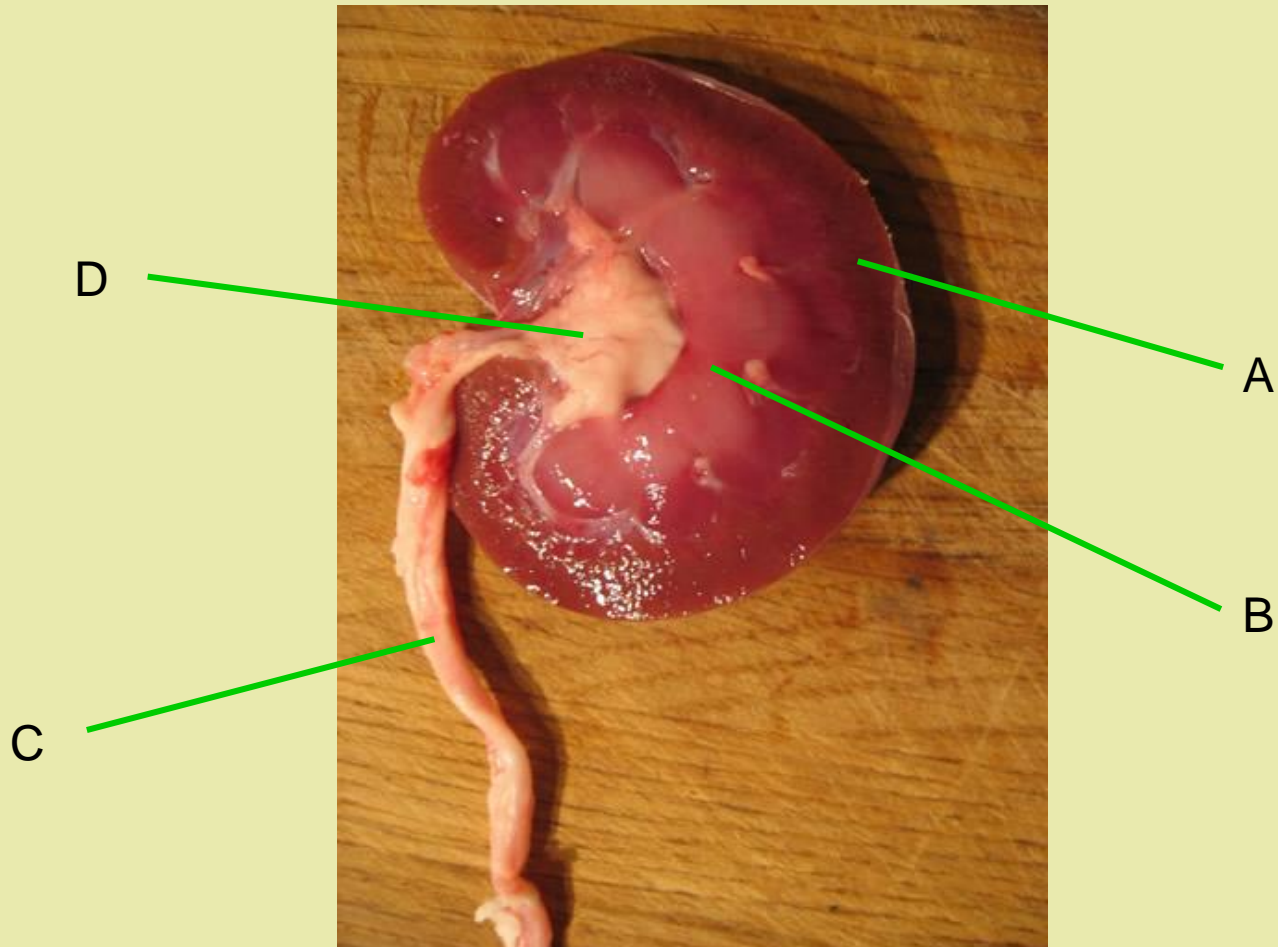
➤ A section through the kidney shows an outer darker region (cortex) and a lighter inner zone (medulla).





# LEARNING CHECK

– Identify Cortex, Medulla, Pelvis, Ureter



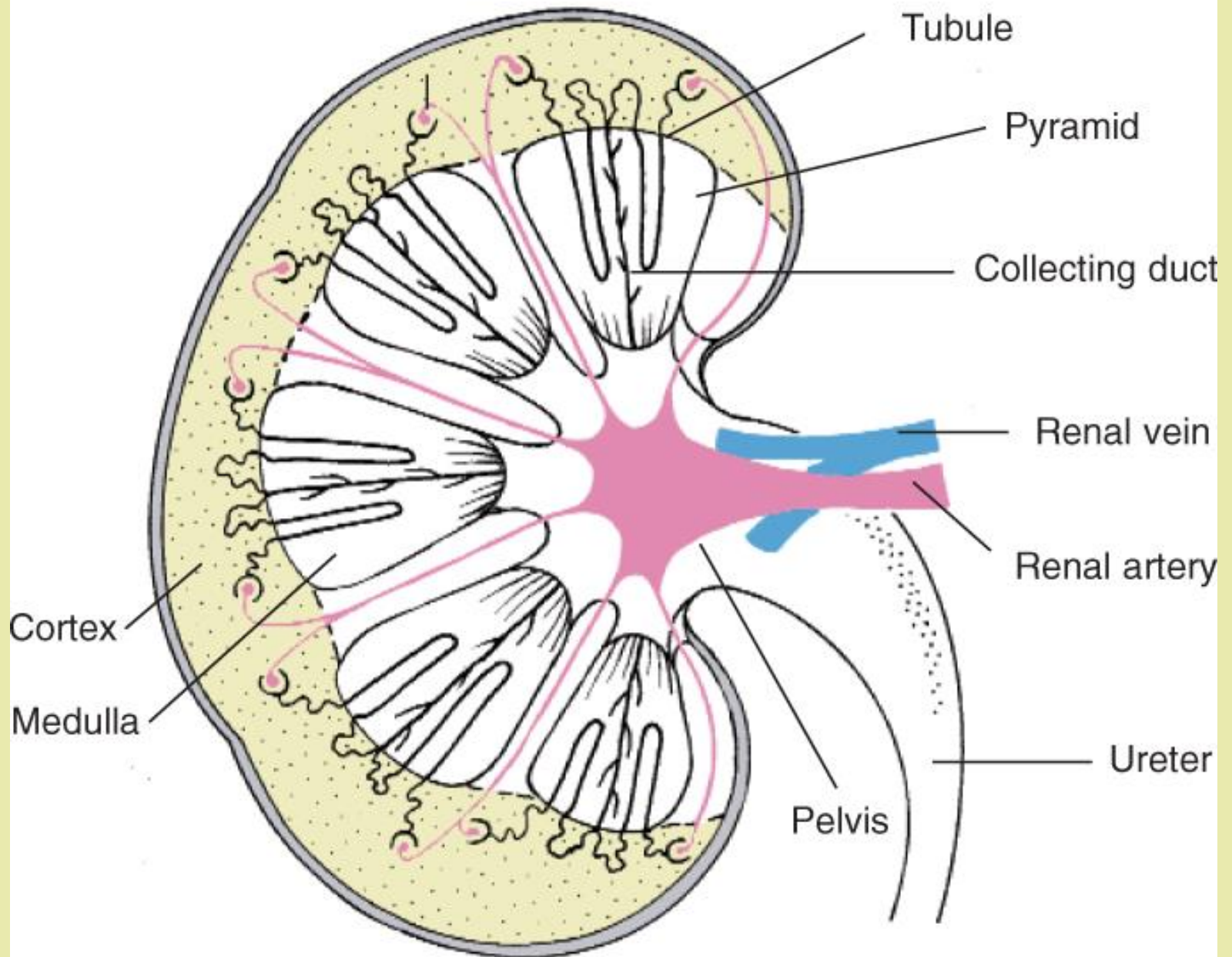
A = Cortex

B = Medulla

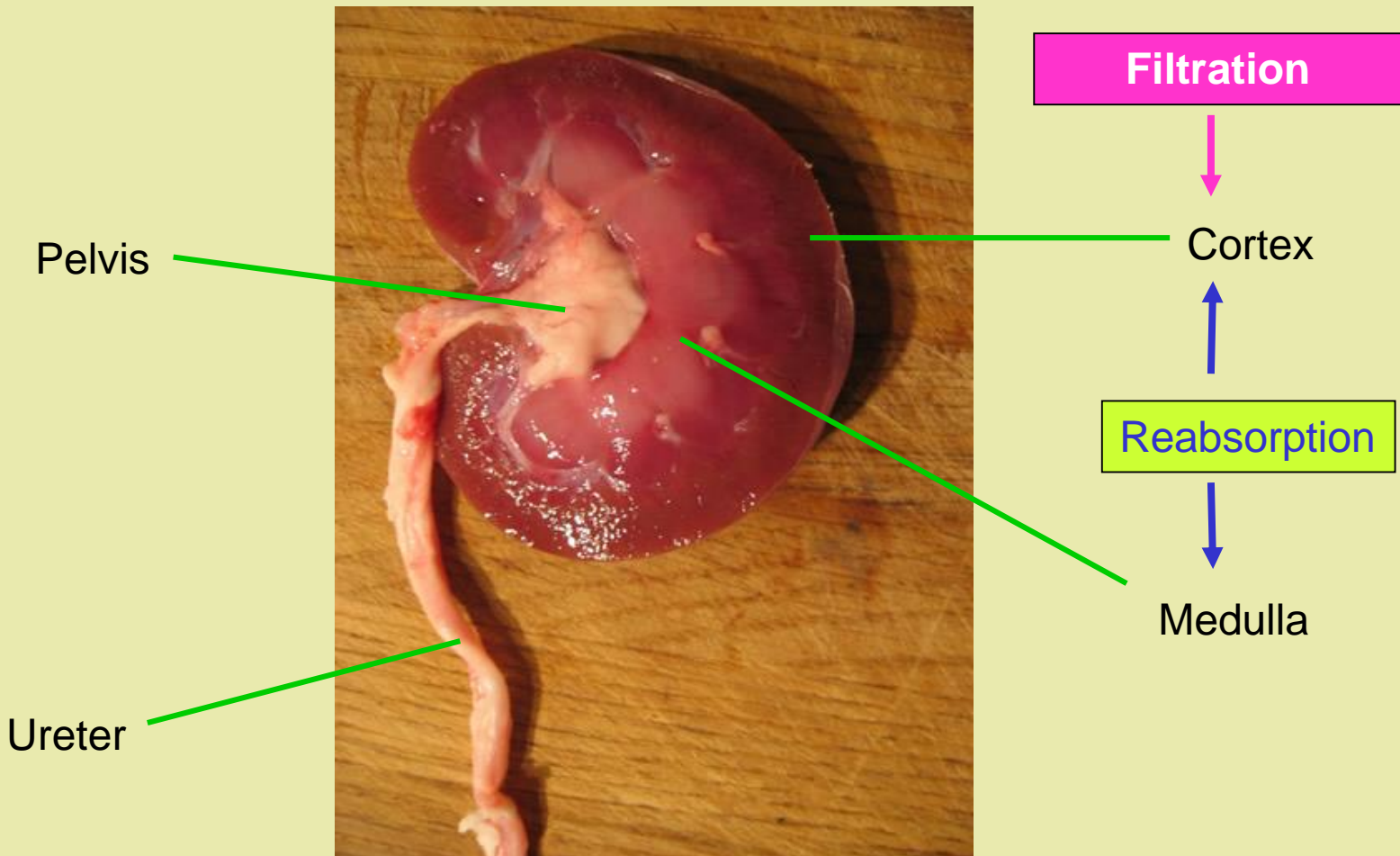
C = Ureter

D = Pelvis

# KIDNEY LS

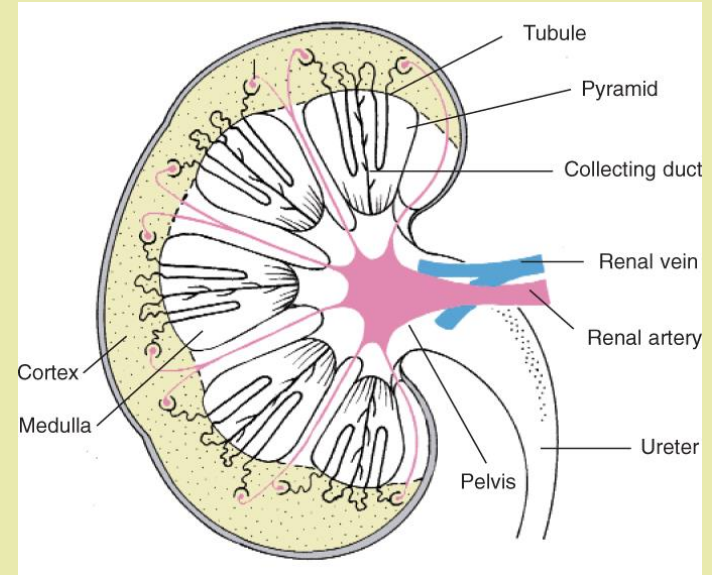


➤ The kidneys work by filtering the blood and then absorbing back what the body needs to keep. The wastes are allowed pass to the bladder, for storage and release.



➤ As urine is produced, it flows into the renal pelvis, then into the ureter, to the bladder.

➤ Filtration—In the outer cortex, small molecules like glucose, amino acids, water, urea and salts filter out of the blood into narrow tubules.

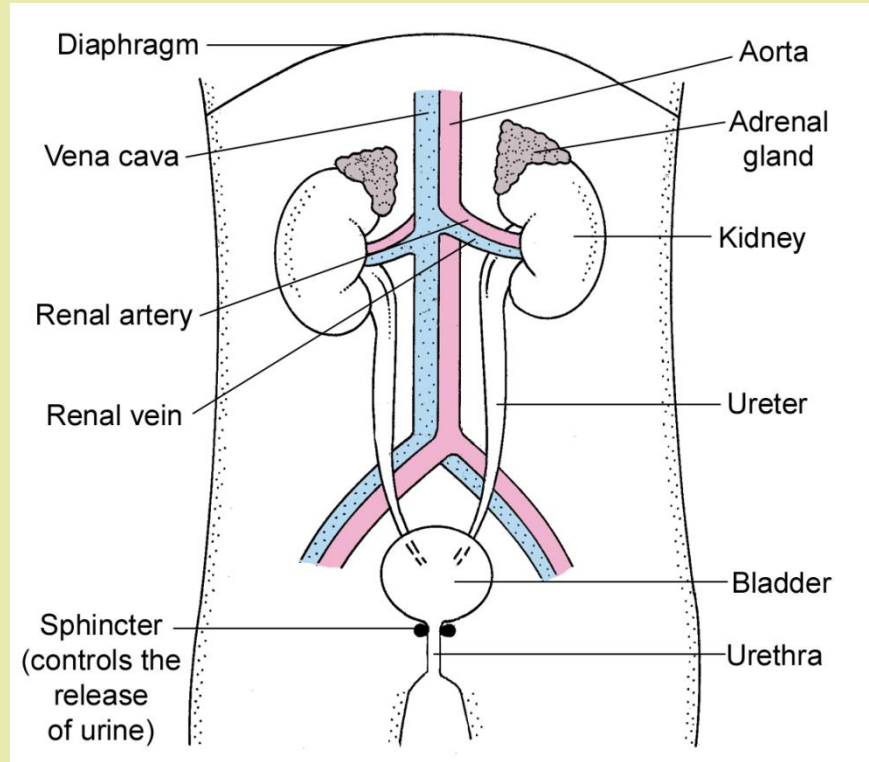


➤ Reabsorption—blood vessels reabsorb back useful nutrients from the tubules.

➤ Urea, excess salts and water, are allowed to continue down the tubule and on to the bladder.

- Secretion is the production and release of chemicals from cells.
- Some substances, especially potassium and hydrogen ions, are secreted from the blood into the tubule in the cortex region.
- **When the blood becomes too acidic, hydrogen ions are secreted into the urine.**
- **By controlling the hydrogen ion concentration in the blood, the kidneys control blood pH.**

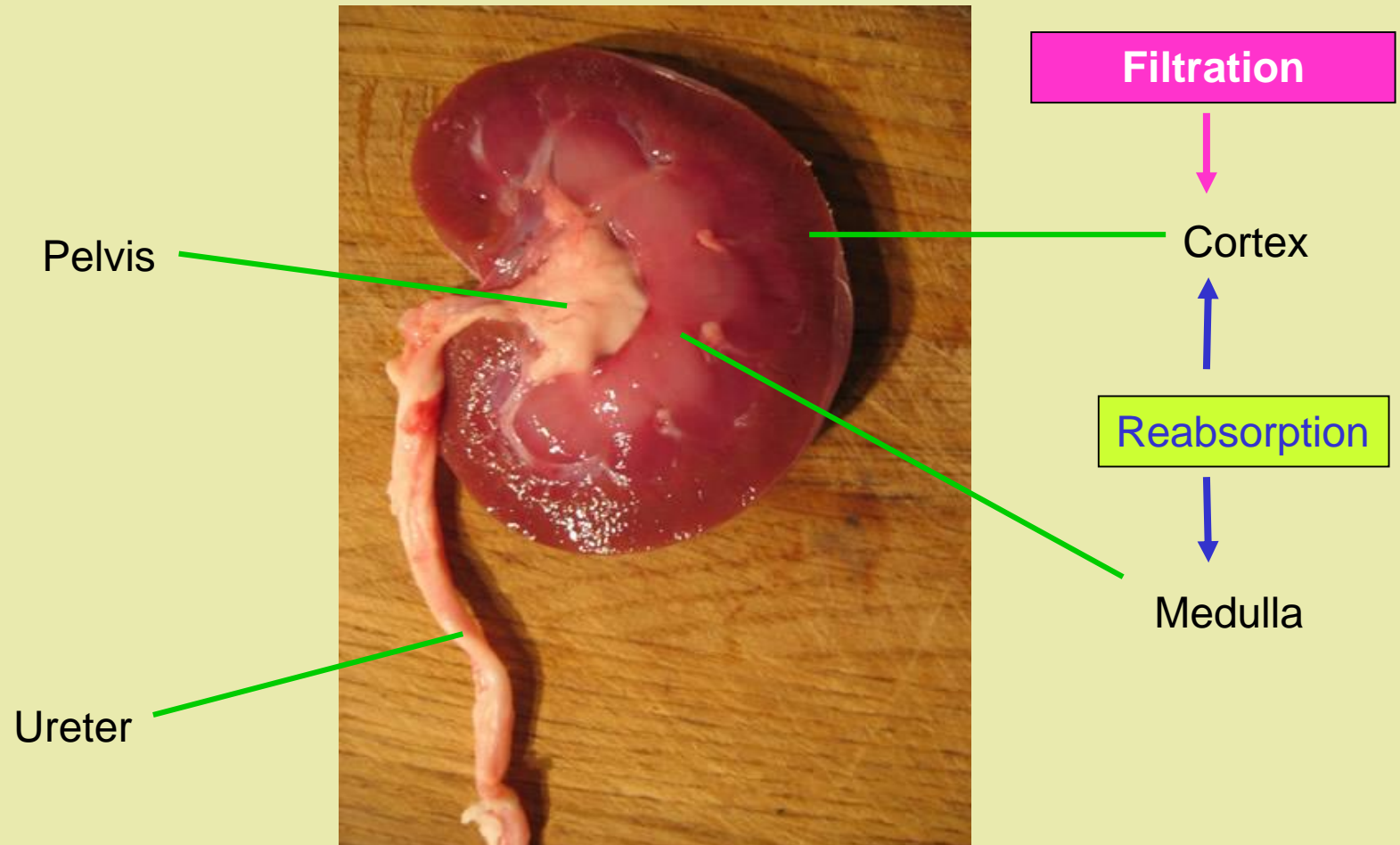
- The bladder stores the urine, which flows through the urethra to the outside.



- Urine is composed of about 96% water, urea, salt, and traces of other substances such as hormones.

# LEARNING CHECK

- Identify Site(s) of Filtration and Reabsorption



# LEARNING CHECK

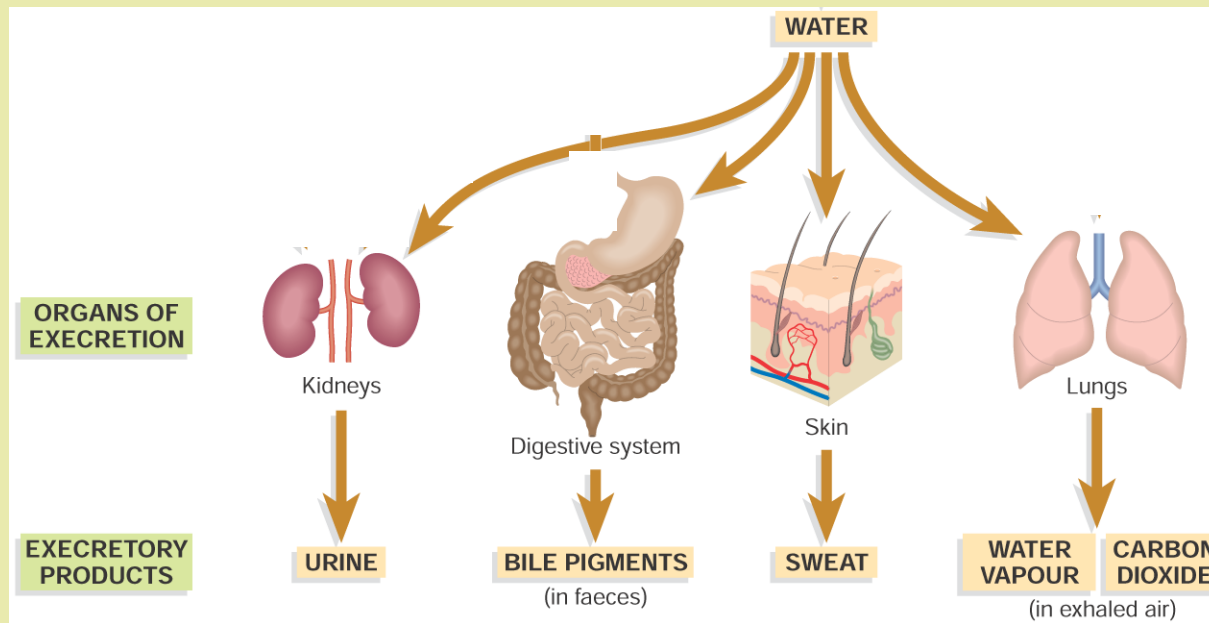
- What is filtration?
- What is reabsorption?
- What is secretion?
- What is the difference between the kidney and the bladder?
- What is urine?



# Homeostasis – Water Levels in the Body

- Being a land animal, we have a continuous need to conserve water.
- Water must be taken in daily and its loss must be carefully regulated.
- Water is taken in as food and drink, and is also formed inside the cells during some reactions, especially respiration.
- Water is lost from the body through our lungs, skin, intestines and kidneys.

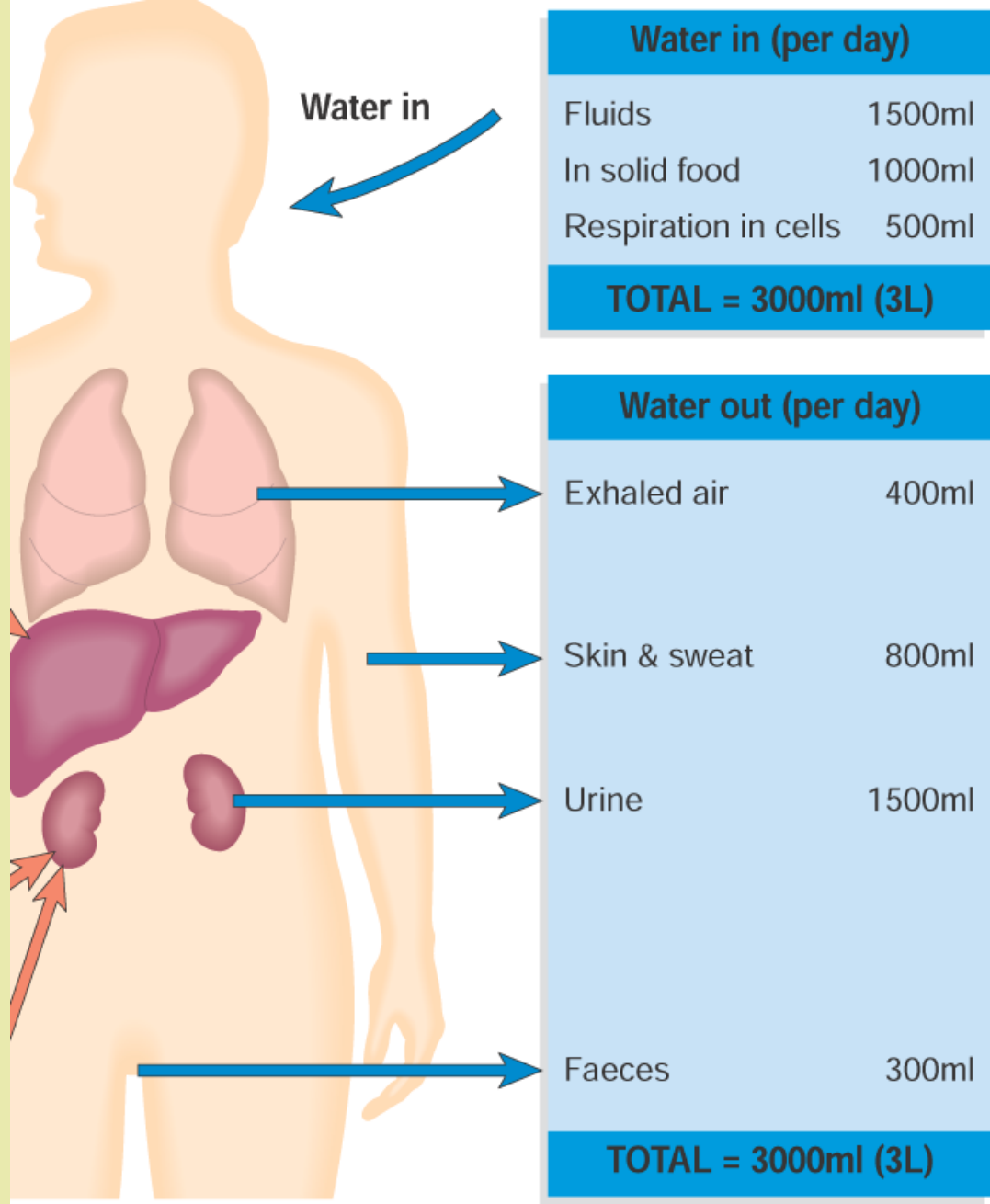




Water is lost from the body through a number of ways:

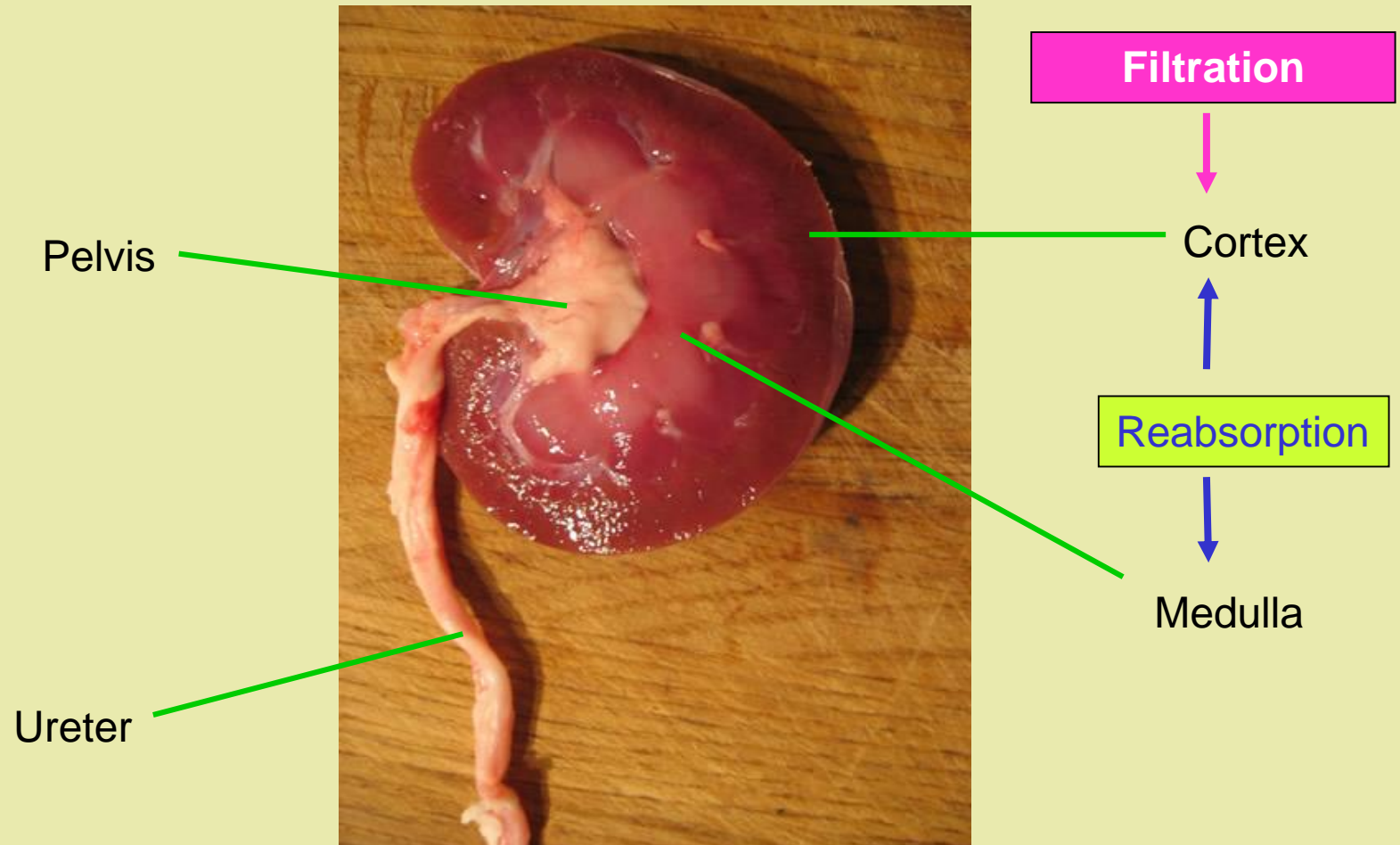
- Lungs – some water gets evaporated as we exhale from our warm, damp lungs.
- Skin – by evaporation from cells and through sweat.
- Intestines – in the faeces (undigested food).
- Kidneys – in dissolving the poisons and wastes we wish to excrete from the body.

- We have no control over the amount of water lost each day from the lungs, skin or intestines.
- So the kidneys are the water control (**osmoregulatory**) organs of the body – conserving or eliminating water as the body requires.



# LEARNING CHECK

- Identify Site(s) of Filtration and Reabsorption



# LEARNING CHECK

- Name the ways we gain water.
- Name the ways we lose water.
- What is osmoregulation?

# Homeostasis – Temperature Regulation

- Temperature influences the rate of enzyme-controlled reactions that sustain life.
- Mammals and birds are **endotherms** (warm blooded): they have a fairly constant body temperature.



- They can operate in low temperature environments, as they can keep the rate of enzyme activity high.

- Most animals are **ectotherms** (cold blooded) —their body temperature varies with the external temperature, e.g. fish, amphibians, reptiles.

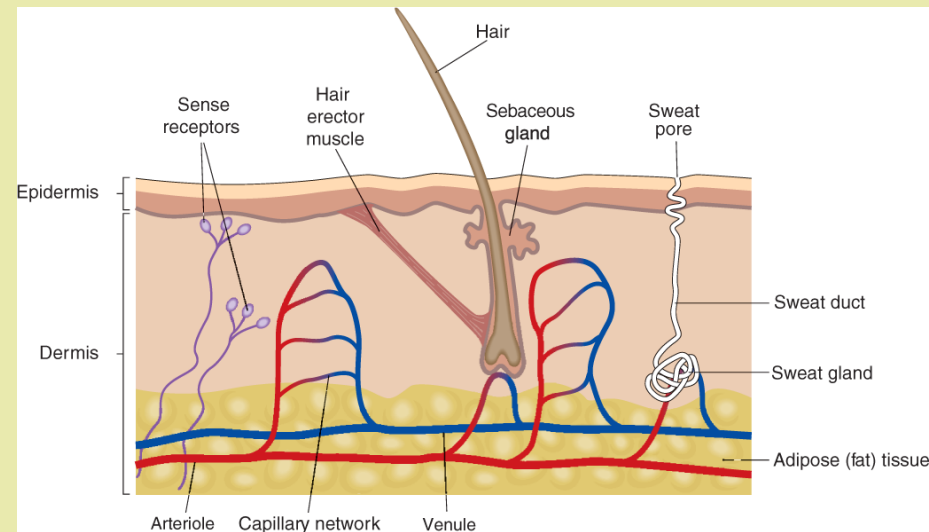


### 3.4.6 --- Body temperature

- Control of body temperature is an example of how homeostasis works in humans.
- Our normal core body temperature is maintained at 37°C, the heat being mainly produced from metabolism in the liver.
- Muscles, skin and blood all play a role in controlling body temperature.

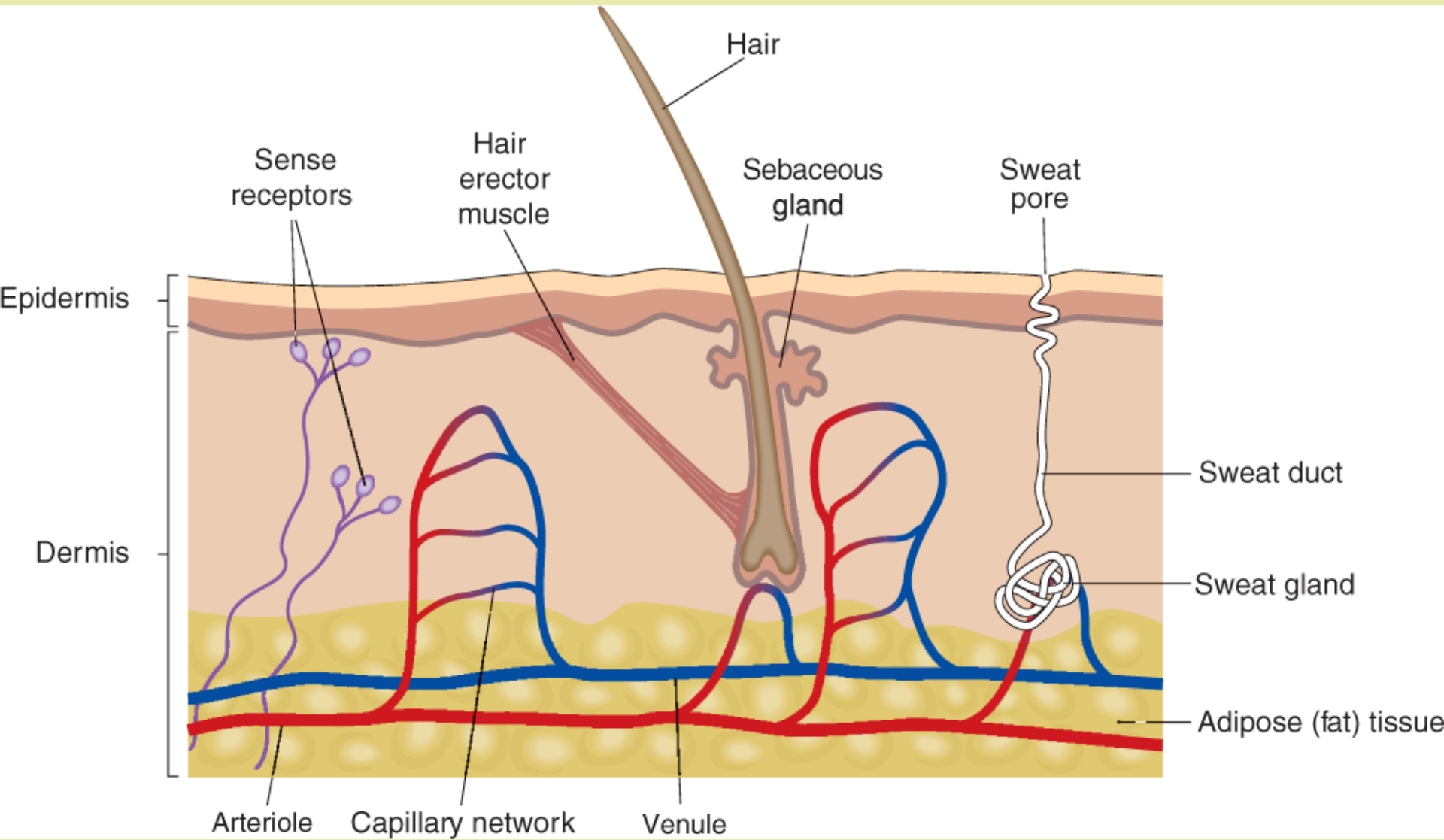
- Role of Skin in Homeostasis  
-- Temperature Regulation

- Role of Skin as Excretory Organ  
– removal of sweat

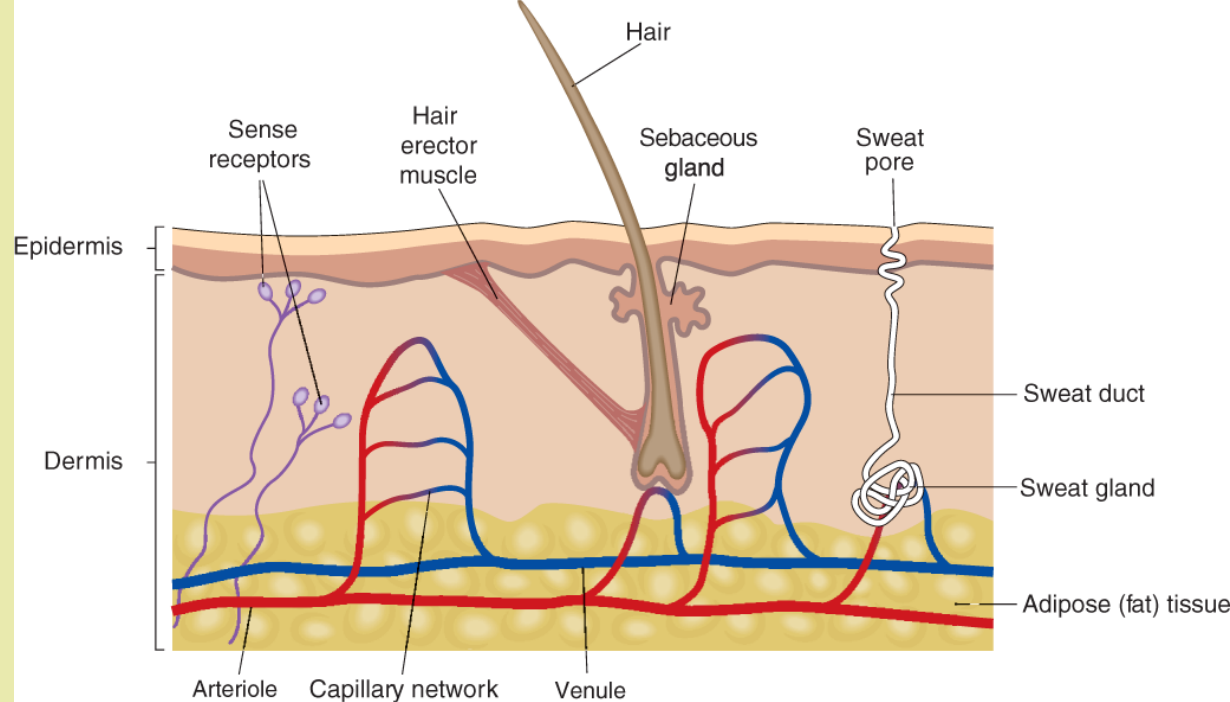




# The SKIN

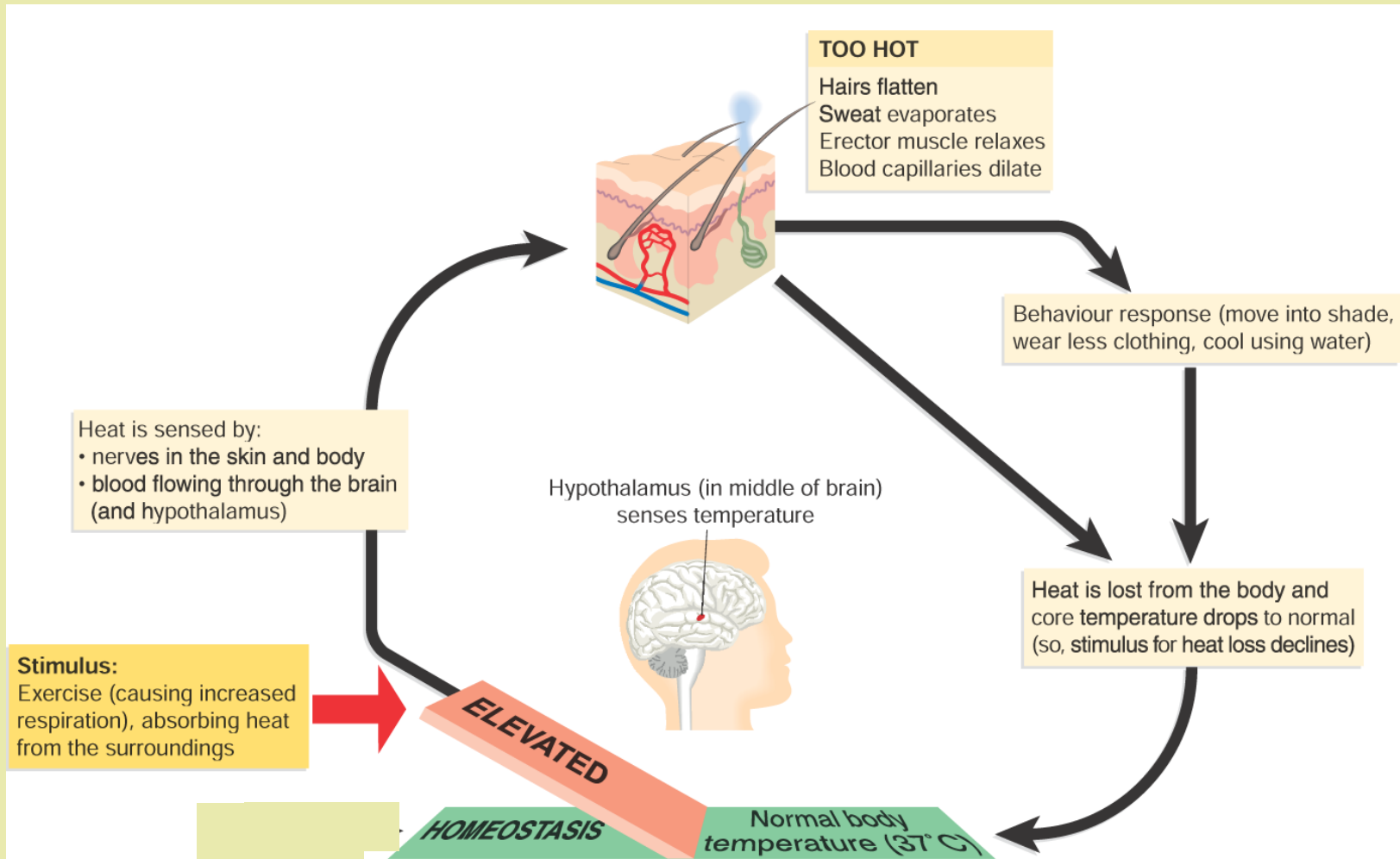


## ❖ If our temperature rises

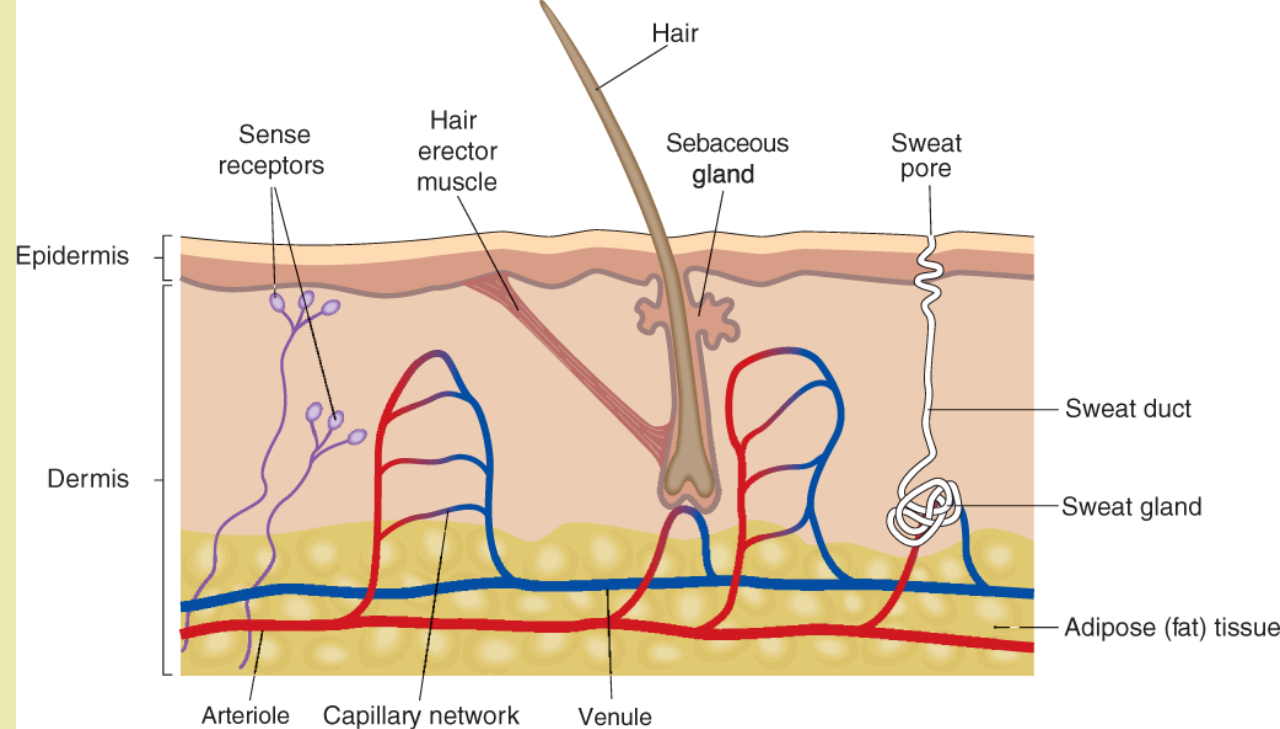


- more blood flows close to surface of skin so heat is lost by radiation;
- glands release sweat (a weak salt solution) onto the surface of the skin—this perspiration cools the skin, by taking away some of the body heat when it evaporates.
- This loss of water, as sweat, must be replaced—that is why it is important to drink water before, during and after exercising to maintain the balance of water and salts in the body.

- If our temperature rises, more blood flows close to surface of the skin and glands release sweat.

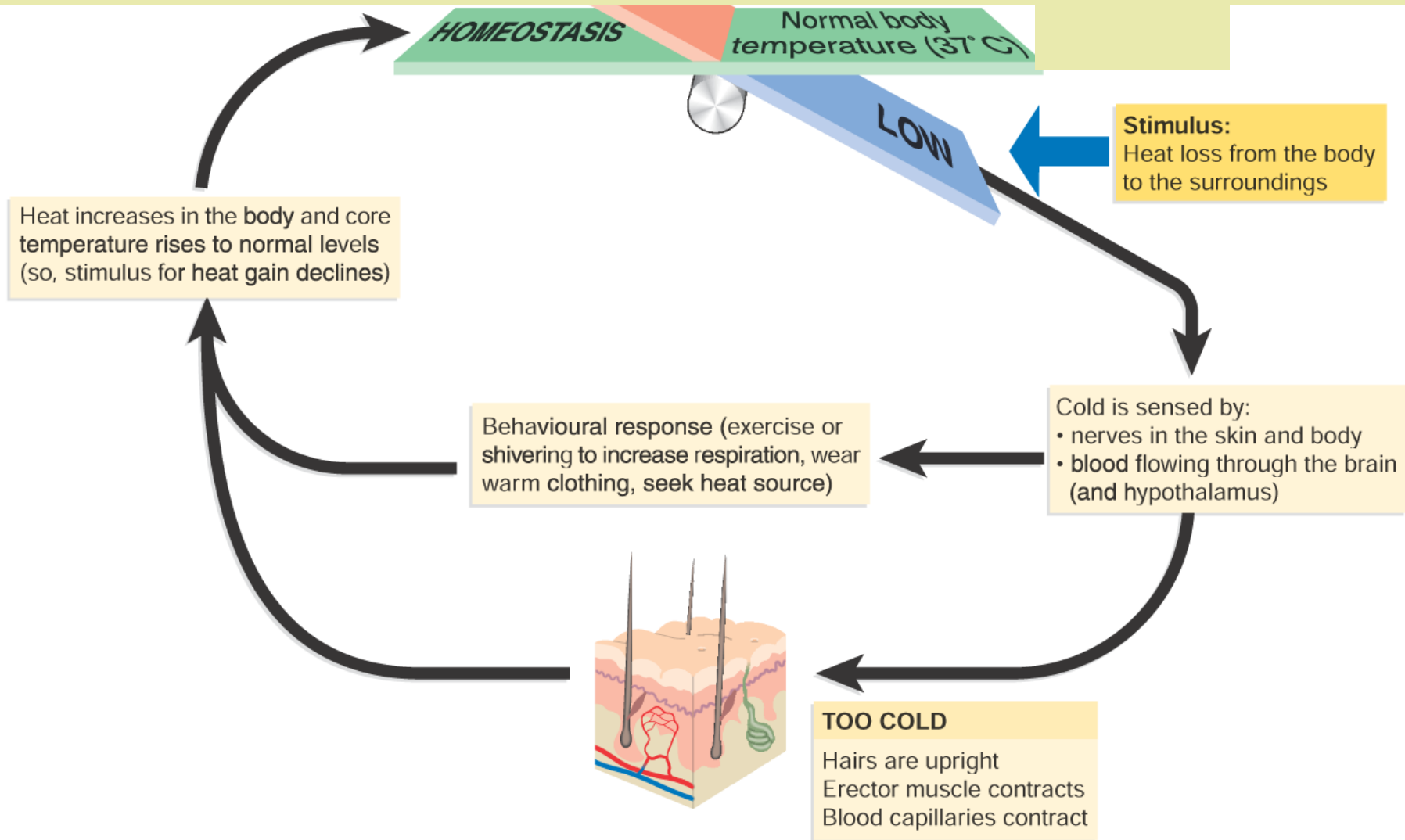


❖ If our temperature drops

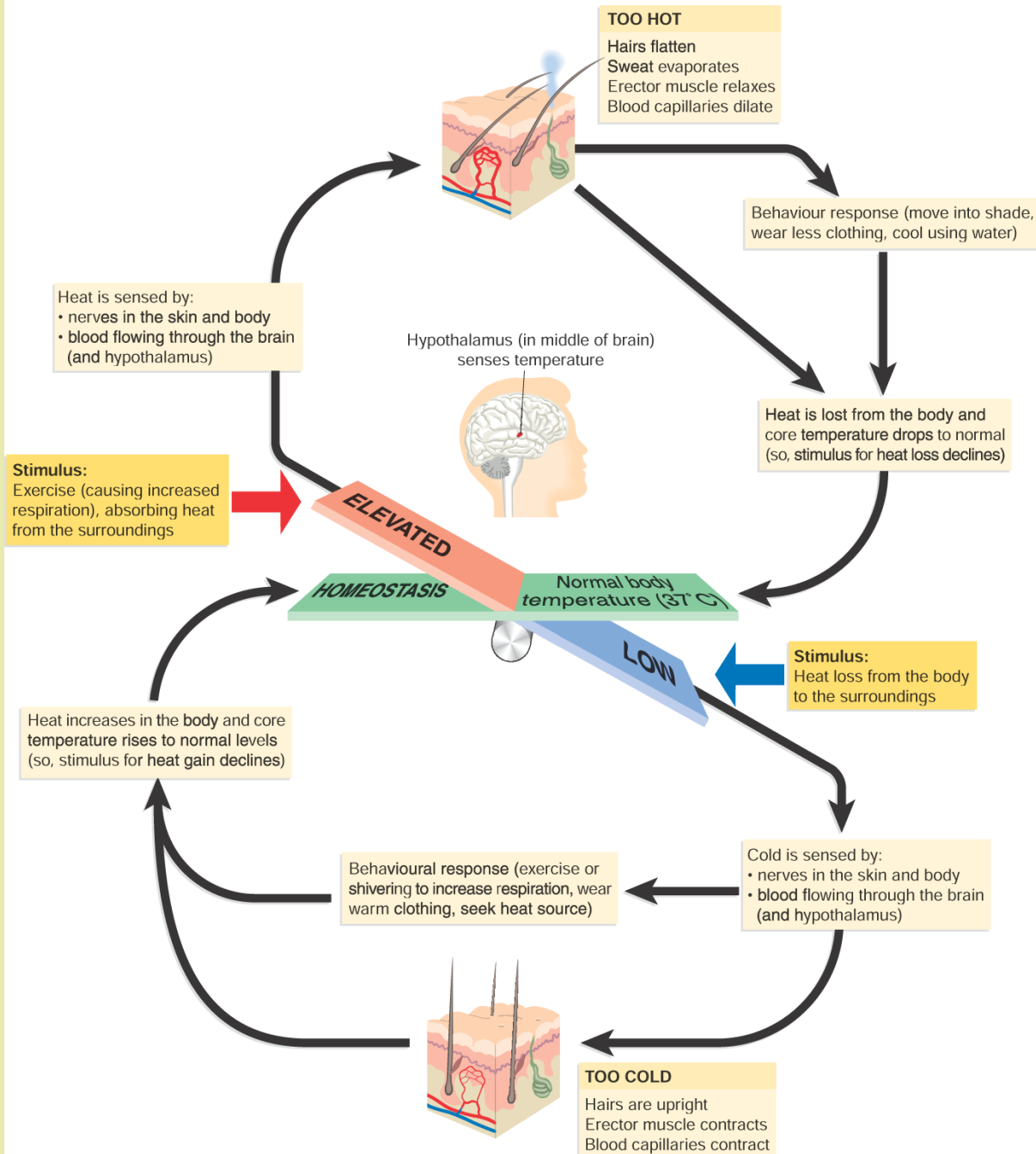


- blood leaves the surface layers and flows beneath the adipose (fat) tissue which insulates us, so less heat is lost through the skin surface;
- we stop sweating;
- hairs stand up (causing ‘goose bumps’) to try and insulate us with air;
- we shiver (muscles contract to generate extra heat).

➤ If our temperature drops, blood flows beneath the adipose tissue, we stop sweating, our hairs stand up and we shiver.



# HOMEOSTASIS -- TEMPERATURE CONTROL



# LEARNING CHECK

## Controlling body temperature

Body temperature is controlled by the thermo-regulatory centre in the \_\_\_\_\_ . It is kept at  $37^{\circ}\text{C}$  as this is the best temperature for \_\_\_\_\_ to work in. If the body becomes too hot then blood vessels \_\_\_\_\_ and sweat glands release \_\_\_\_\_. If the body is too \_\_\_\_\_ then blood vessels constrict and muscles start to \_\_\_\_\_.

**Words** - sweat, enzymes, cold, dilate, shiver, brain

# LEARNING CHECK

- What is an endotherm?
- What is an ectotherm?
- List the functions of the skin.
- What is our normal body temperature?
- What happens when we get too hot ?
- What happens when we get too cold?
- What part of the brain detects changes in our temperature?