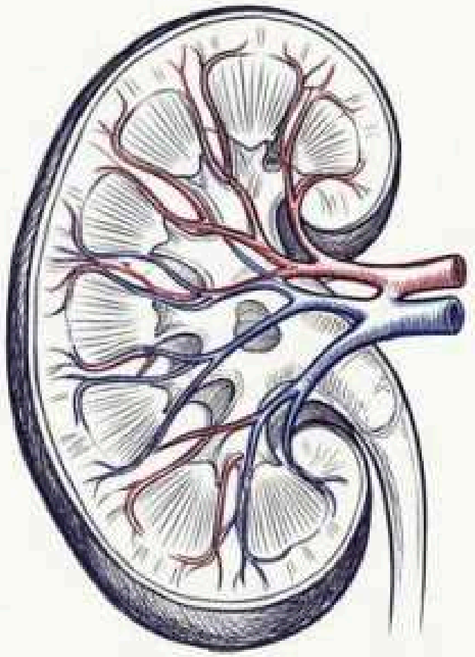
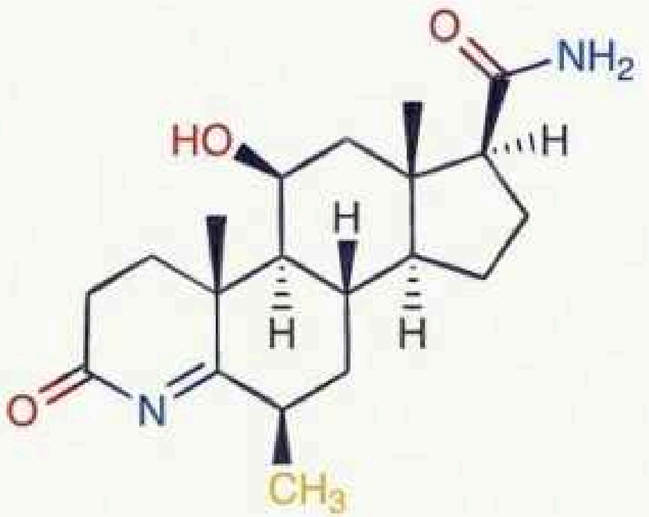
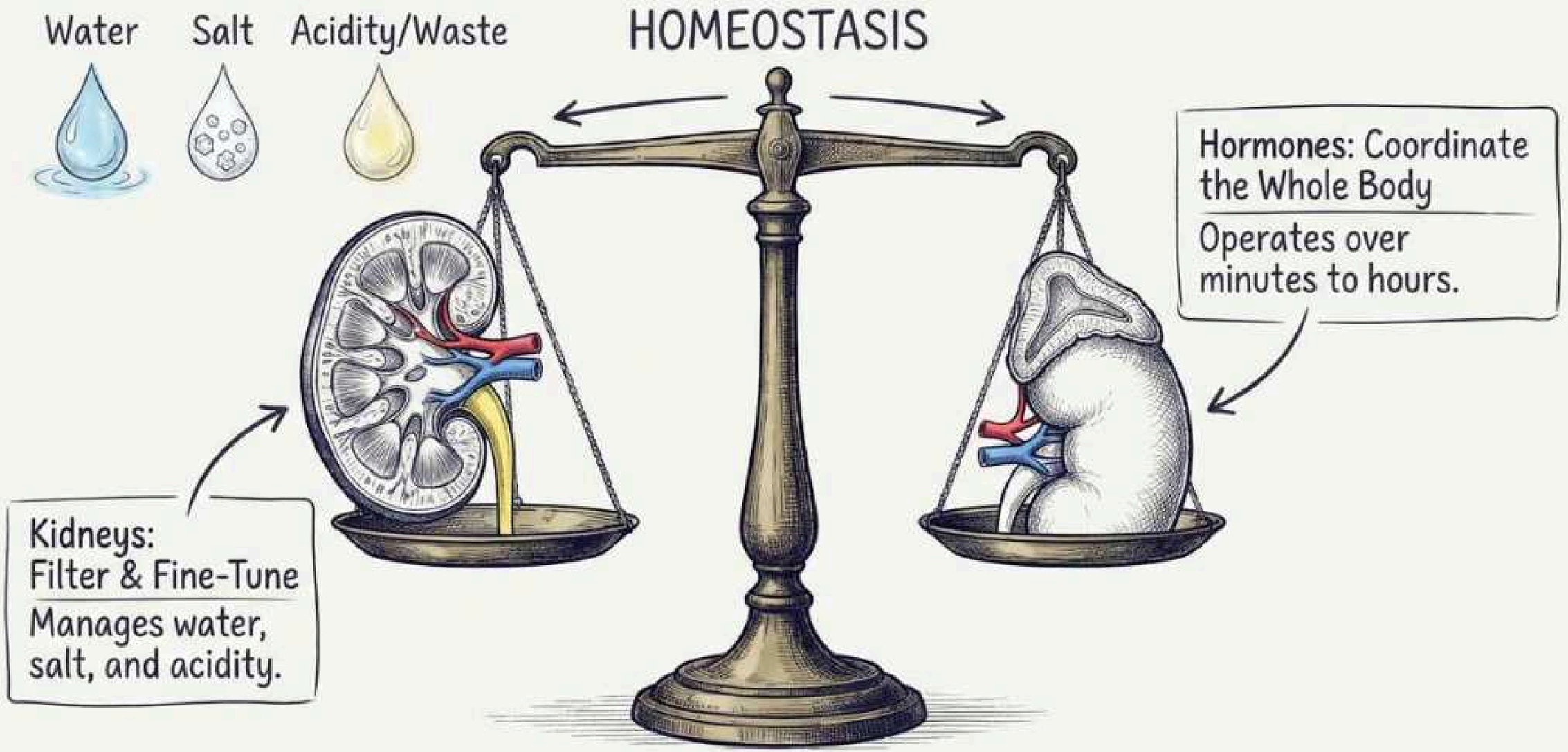
¶6.1

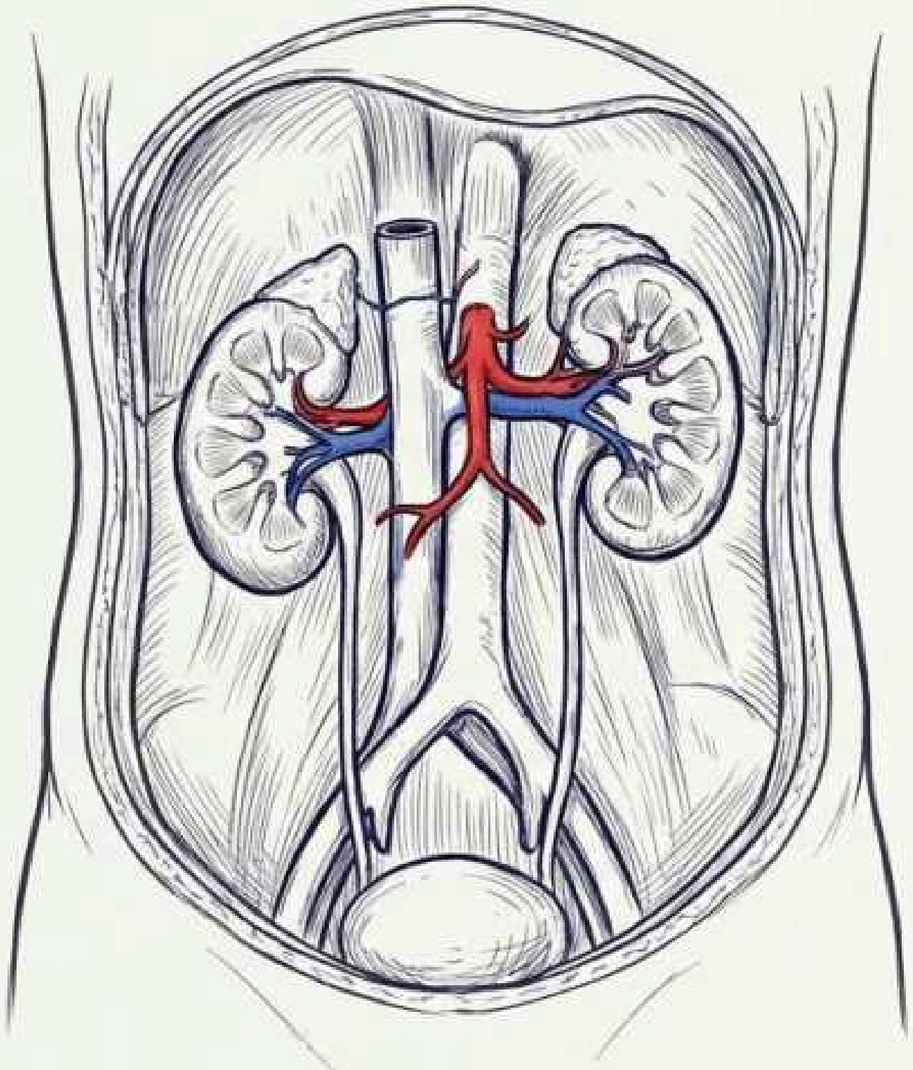




Lecture 6 — The Kidneys, Body Fluids, and Hormones

Welcome to the final lecture of BIO 110 B.


Water
Salt
Acidity/Waste
HOMEOSTASIS
Hormones: Coordinate the Whole Body
Operates over minutes to hours.
Kidneys:
Filter & Fine-Tune
Manages water, salt, and acidity.



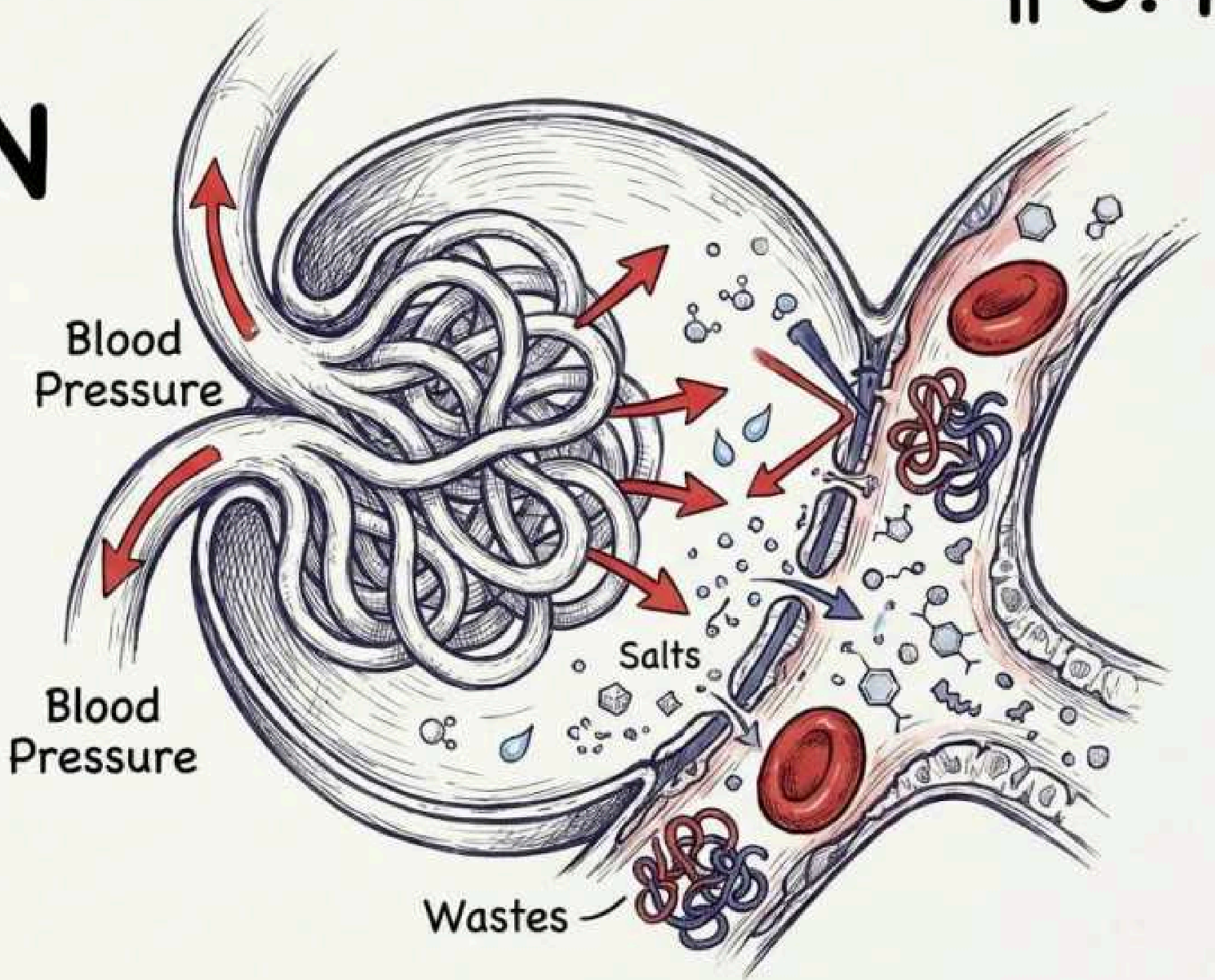
<0.5% Body Weight

22% of Cardiac Output

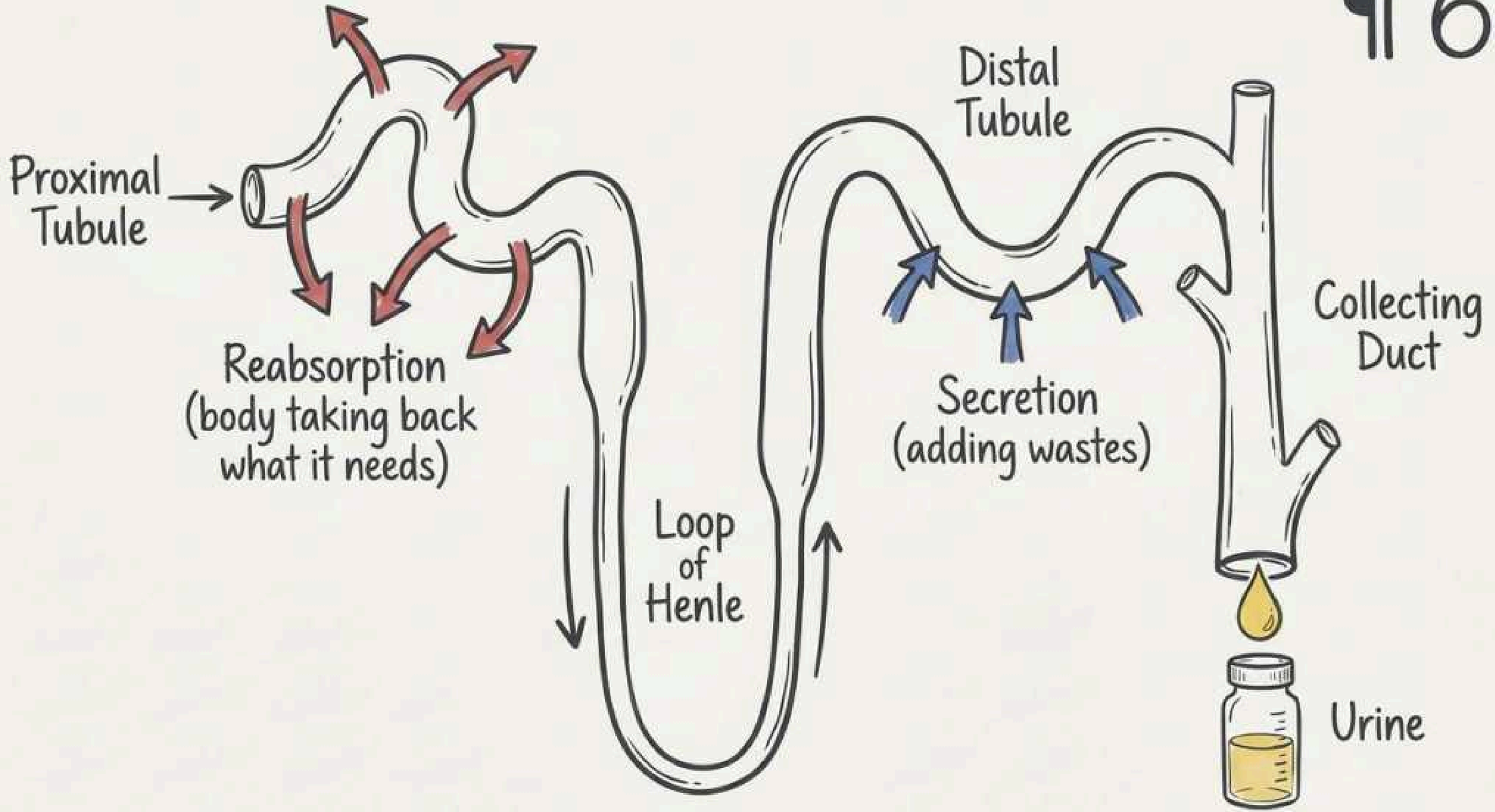
With a cardiac output of 5 L/min, the kidneys receive roughly 1.1 liters of blood every minute.

FILTRATION

Blood pressure pus-pushes fluid out. Cells and large proteins stay; water, salts, and glucose pass through.

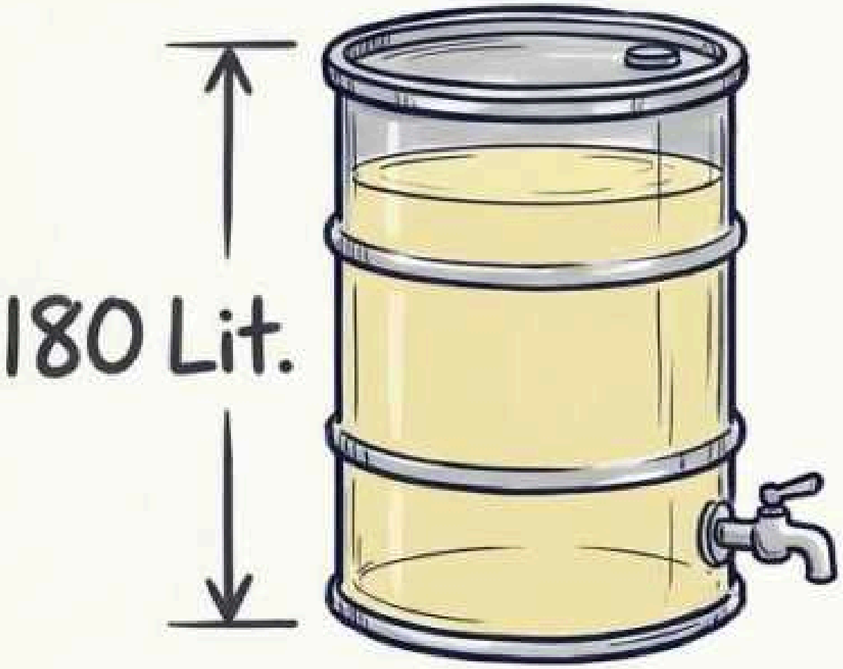


¶ 6.5

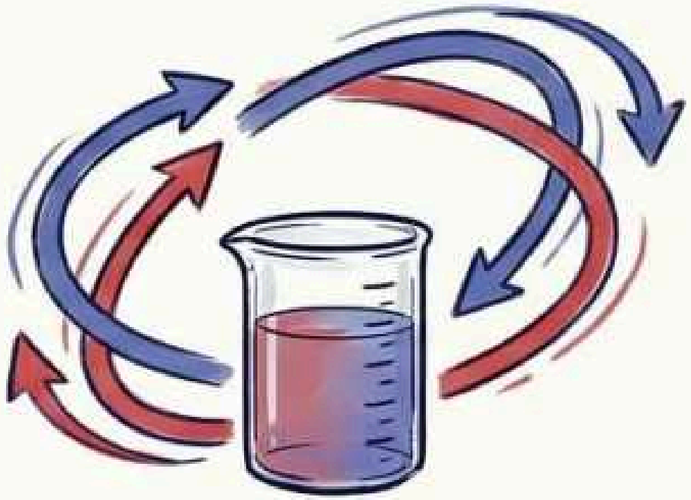

Proximal Tubule
Reabsorption (body taking back what it needs)
Loop of Henle
Distal Tubule
Secretion (adding wastes)
Collecting Duct
Urine

¶ 6.6

$$\frac{125\ \text{mL}}{\text{min}} \times \frac{1{,}440\ \text{min}}{\text{day}} = 180{,}000\ \text{mL} = 180\ \text{Liters}$$



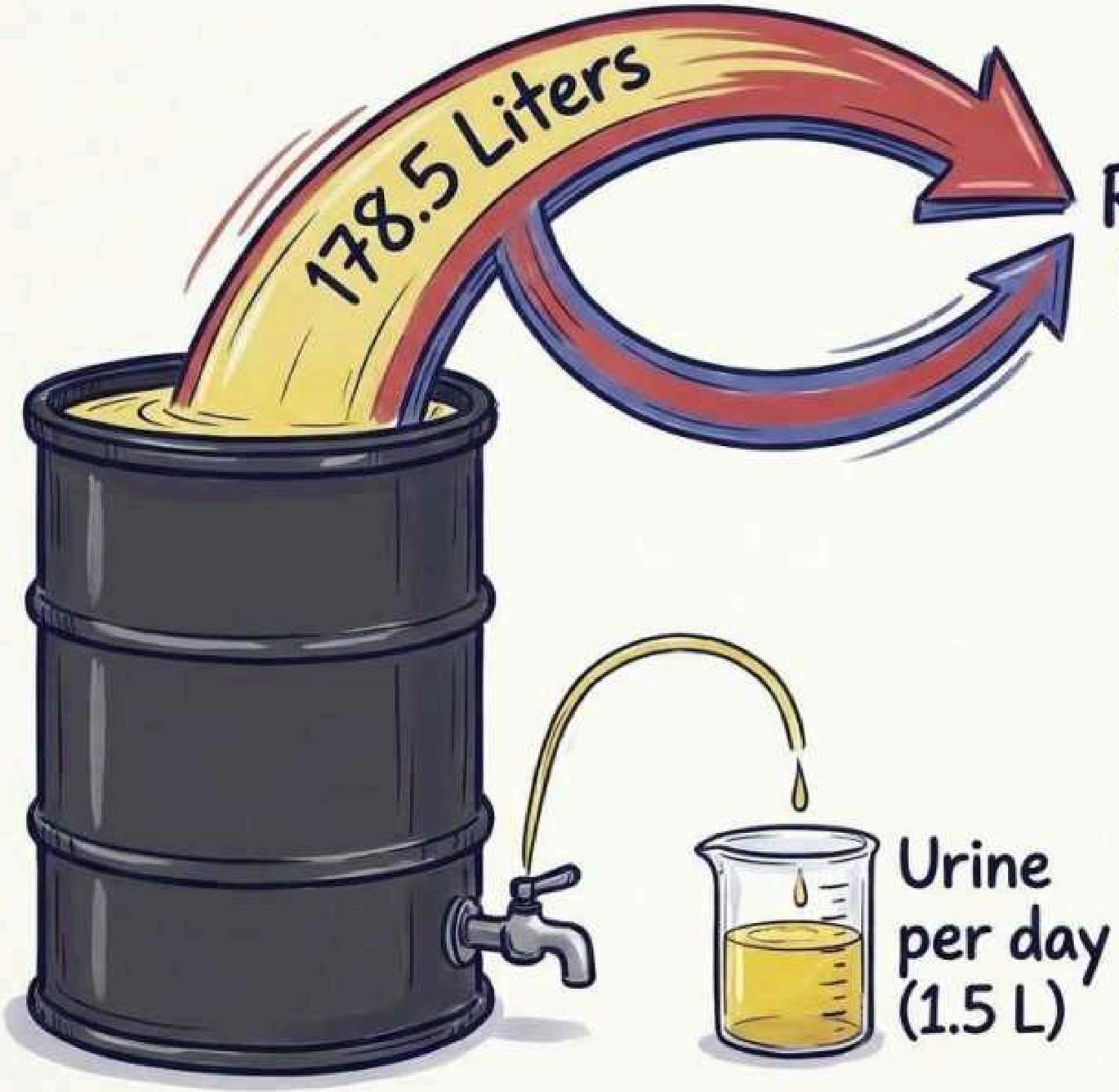
Total Daily
Filtered Fluid



Total Body
Plasma Volume

Filtered
60 times
each day

¶ 6.7

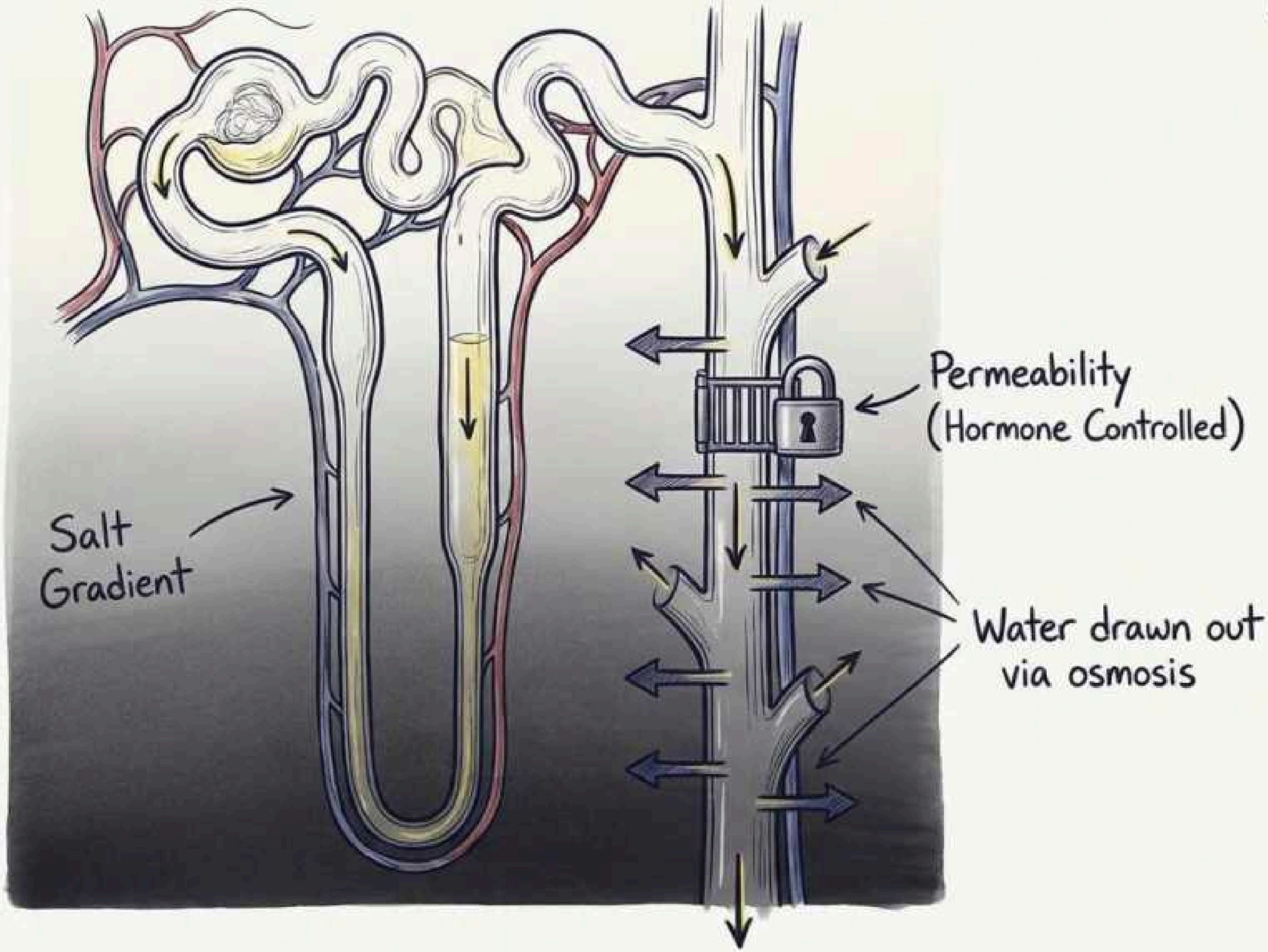


Reabsorbed (99.2%) back to the body

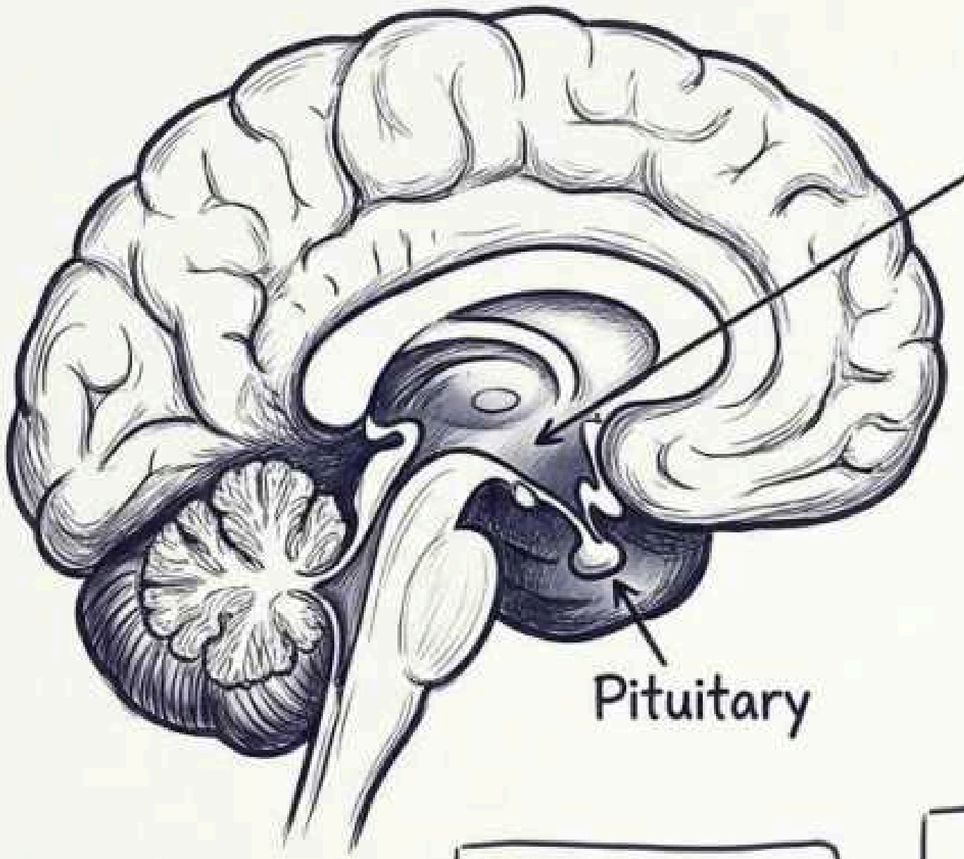
Urine per day (1.5 L)

- Proximal tubule reclaims two-thirds of the volume.
- Glucose and amino acids are taken back almost completely.

¶6.8

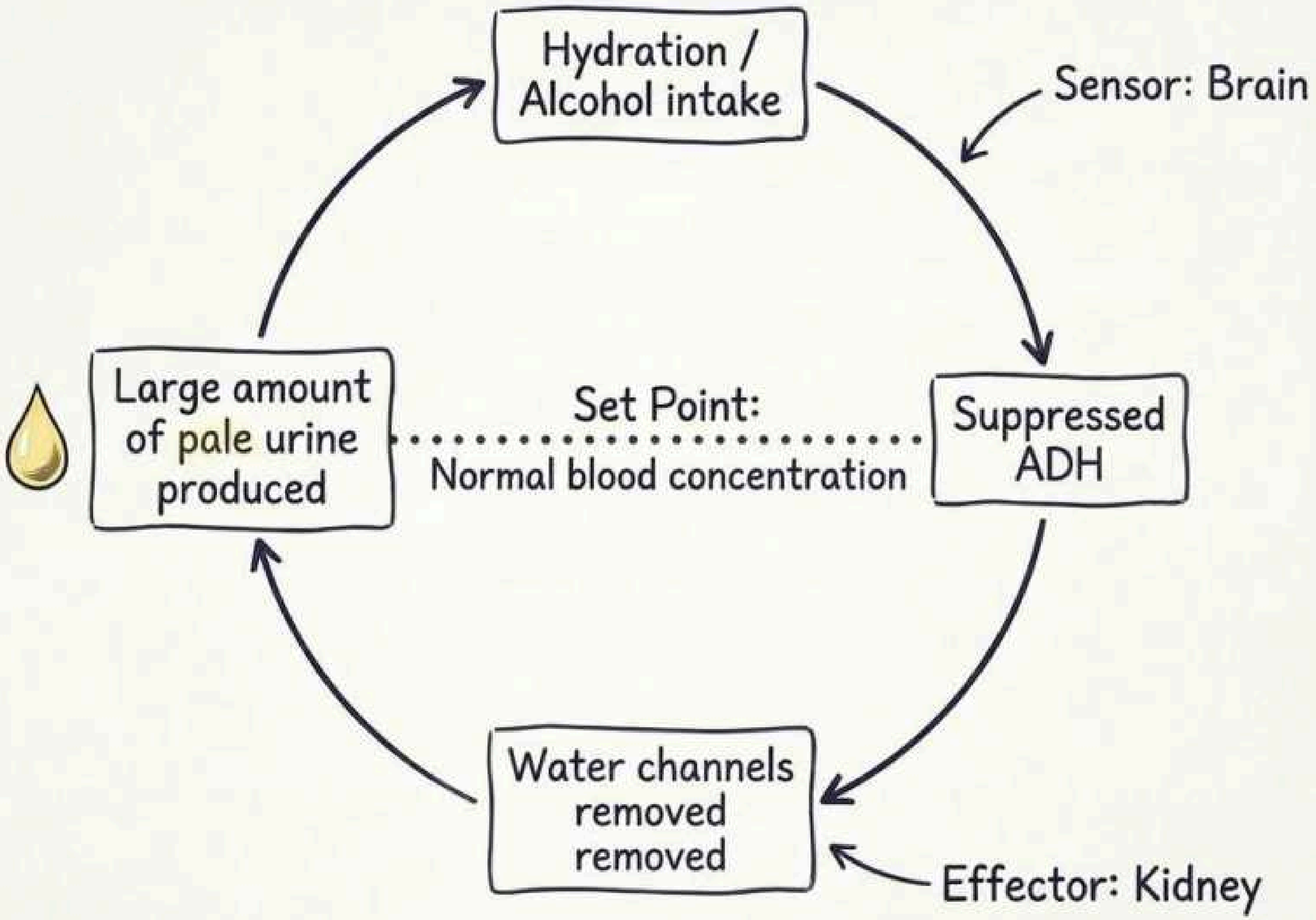

Salt
Gradient
Permeability
(Hormone Controlled)
Water drawn out
via osmosis

¶6.9

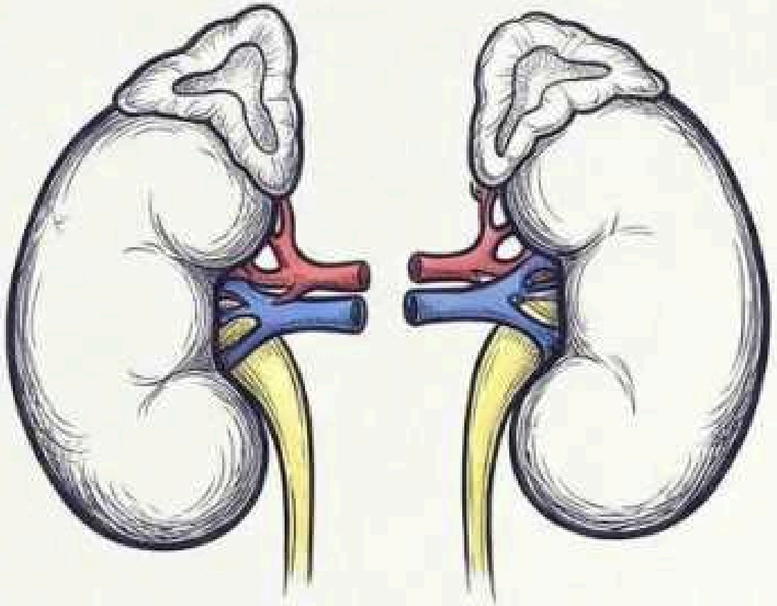


Dehydration → Brain Sensors detect concentrated blood → Pituitary releases ADH (Antidiuretic Hormone) → Water channels inserted into collecting duct → More water returns to blood → Small, dark urine

¶ 6.10


Hydration / Alcohol intake
Sensor: Brain
Large amount of pale urine produced
Set Point:
Normal blood concentration
Suppressed ADH
Water channels removed removed
Effector: Kidney

¶ 6.11



Low Blood Pressure

↓

Kidney releases Renin

↓

Angiotensin produced
(Vessels narrow)

↓

Adrenal glands
release Aldosterone

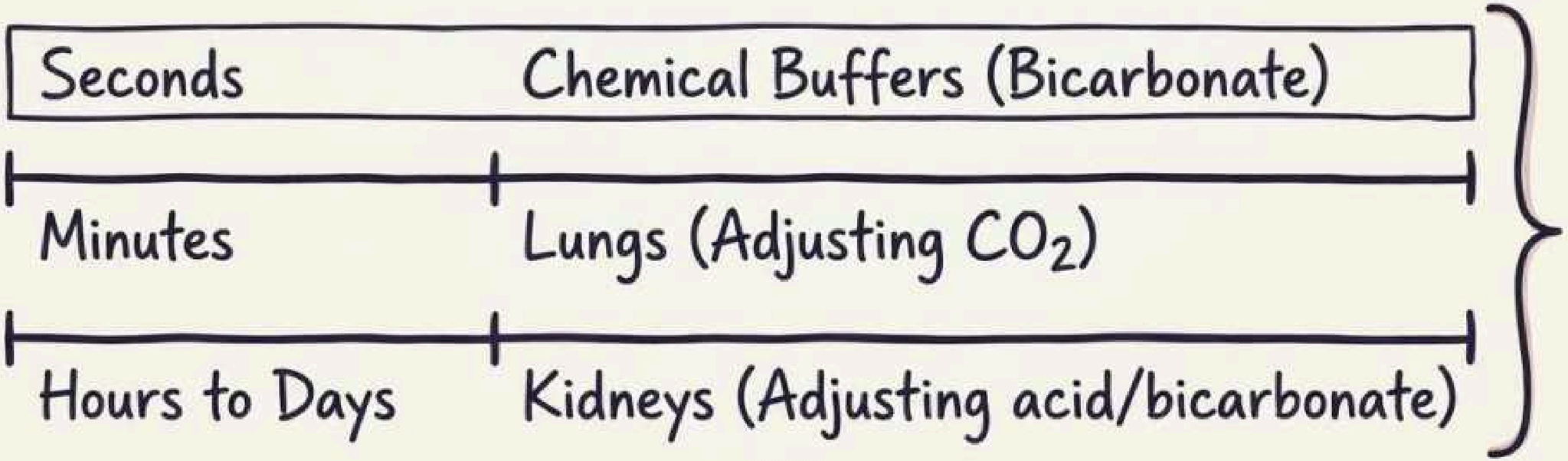
↓

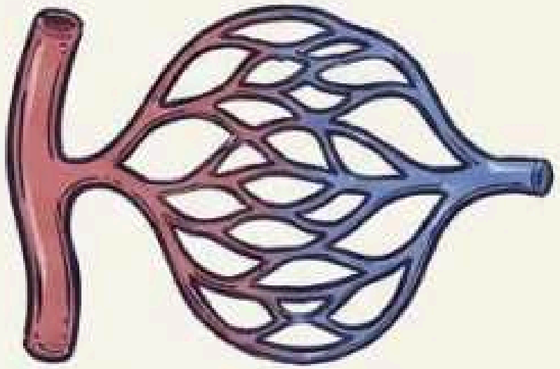
Kidney keeps Sodium
(Water follows)

Target for many
blood pressure drugs

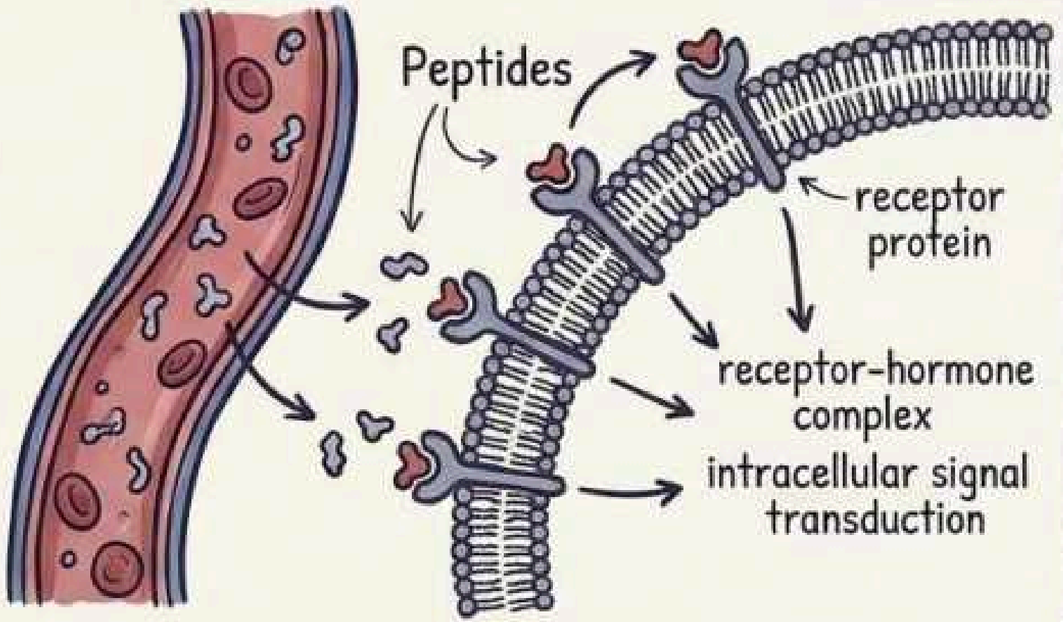


Scale is logarithmic: a fall from 7.4 to 7.0 means 2.5x more hydrogen ions.

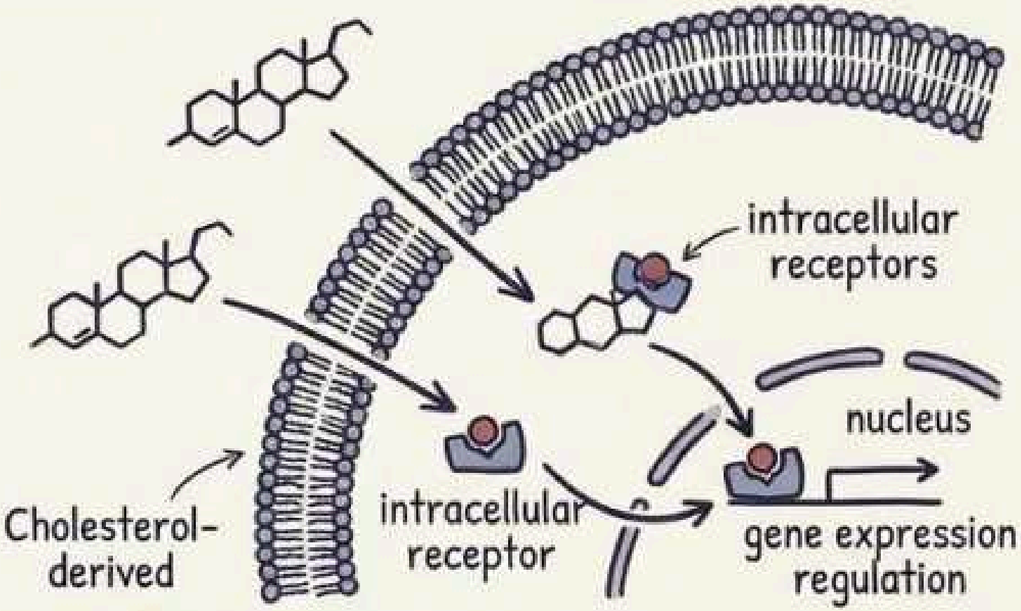


Nerves	Hormones
	
Speed: Milliseconds to seconds. Scope: Precise targets.	Speed: Minutes to days. Scope: Broad reach (requires specific receptors on target cells).

Peptide Hormones (e.g., Insulin)



Steroid Hormones (e.g., Cortisol/Sex hormones)



Amine Hormones (e.g., Epinephrine/Thyroid)

This is the third chemical group, with varied interaction mechanisms (e.g., Epinephrine behaves like a peptide, Thyroid behaves like a steroid).

Hypothalamus (Brain)

↓ sends Releasing Hormones

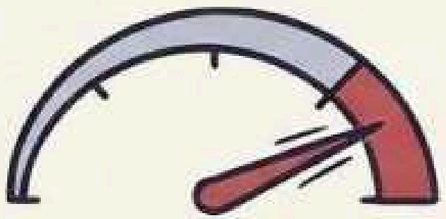
Pituitary Gland

↓ sends Signals

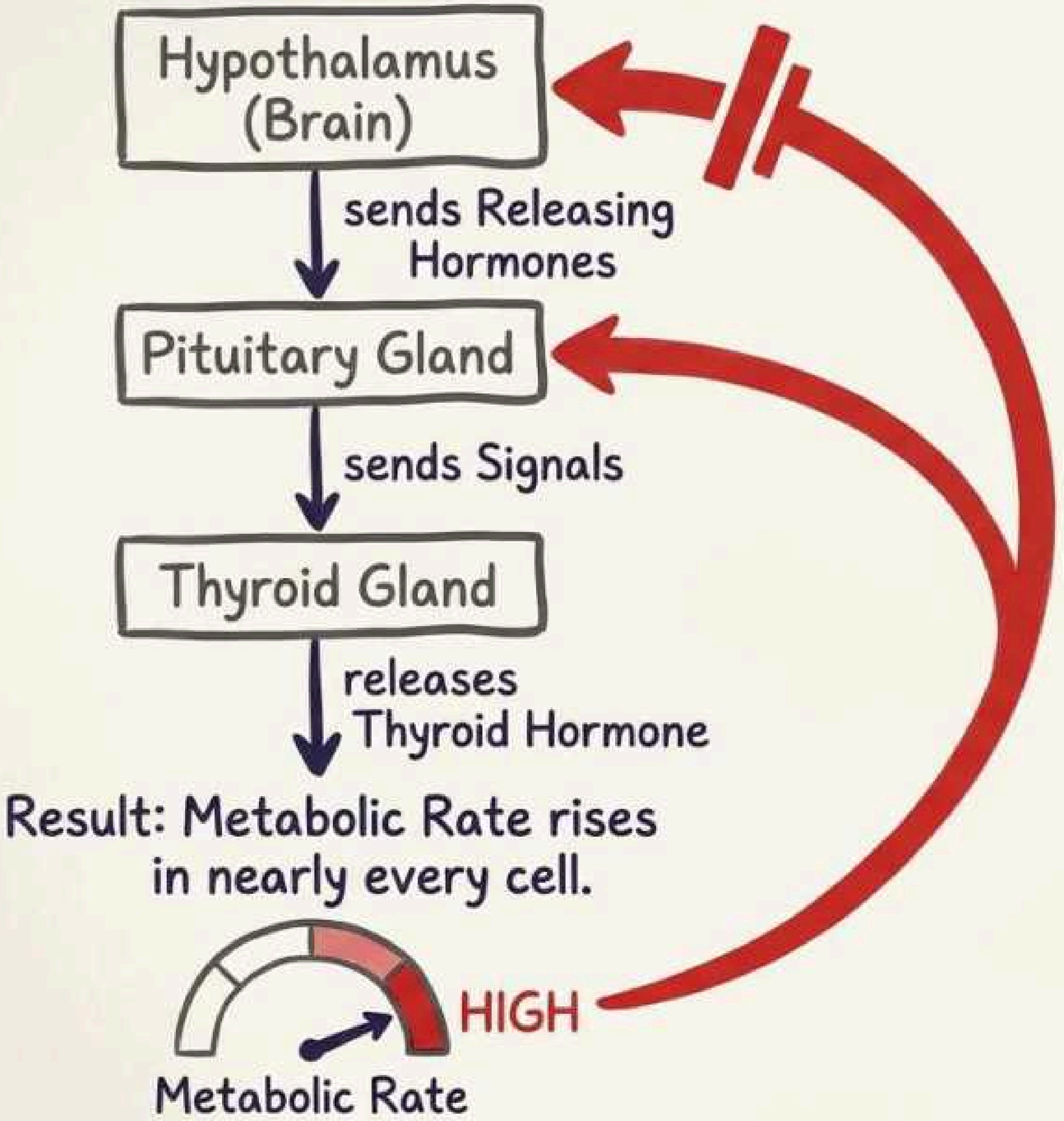
Thyroid Gland

↓ releases Thyroid Hormone

Result: Metabolic Rate rises in nearly every cell.

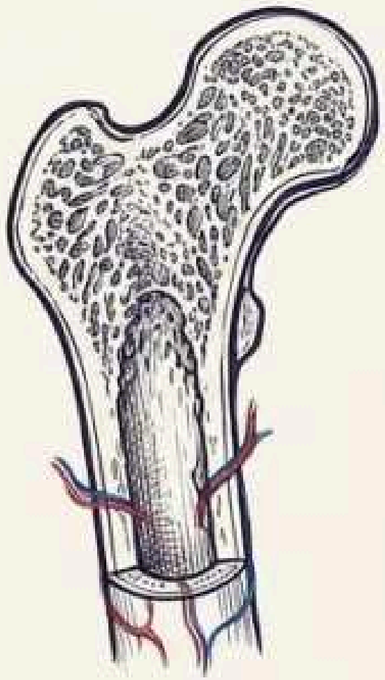


HIGH



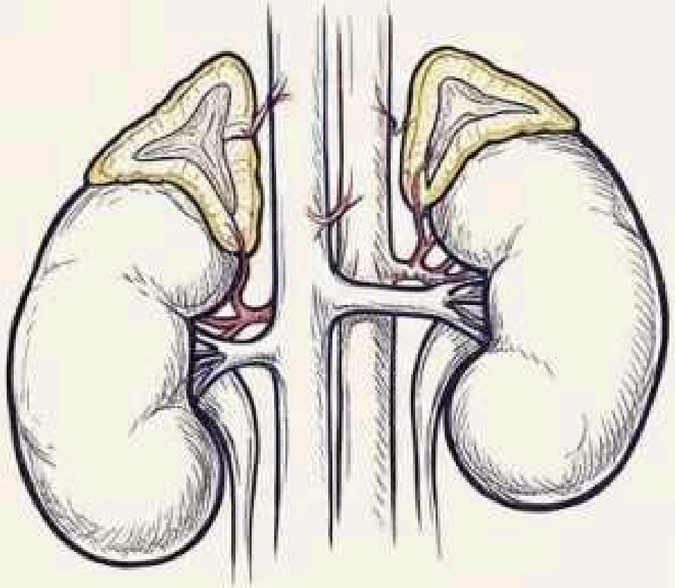
- Underperforming Thyroid
  = Signals Rise ⇧
  (Gland may enlarge)

- Overperforming Thyroid
  = Signals Fall ⇩



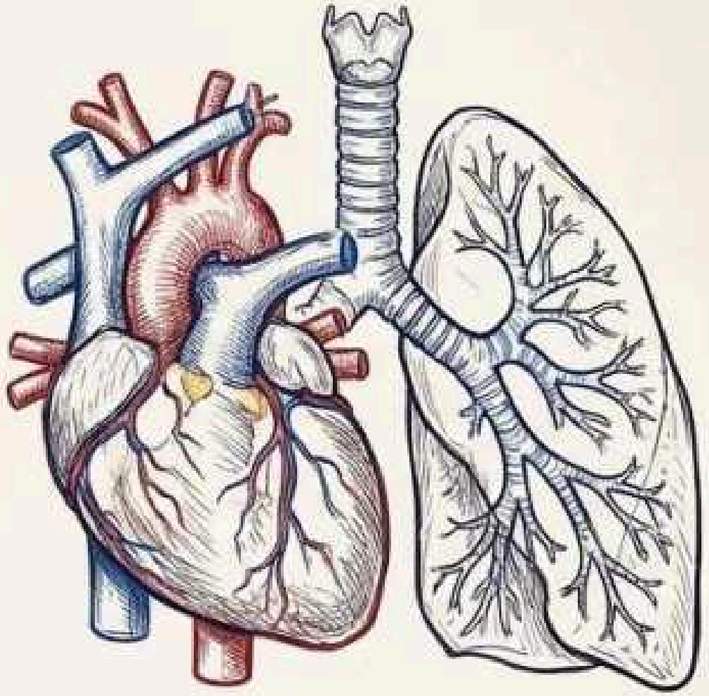
Parathyroid Hormone (PTH)

Raises blood calcium when it falls.



Cortisol

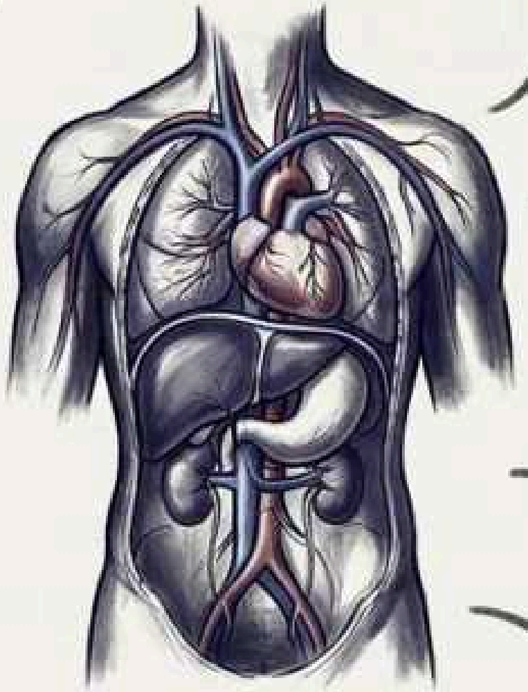
Faces prolonged stress, raises blood glucose.



Epinephrine (Adrenaline)

Prepares for sudden action. Acts within seconds to speed heart and widen airways.

Running for a bus (Hot day)



Brain commands leg muscles (Motor neurons)

Heart rate & cardiac output climb

Breathing deepens and quickens

Liver releases glucose (burned with oxygen)

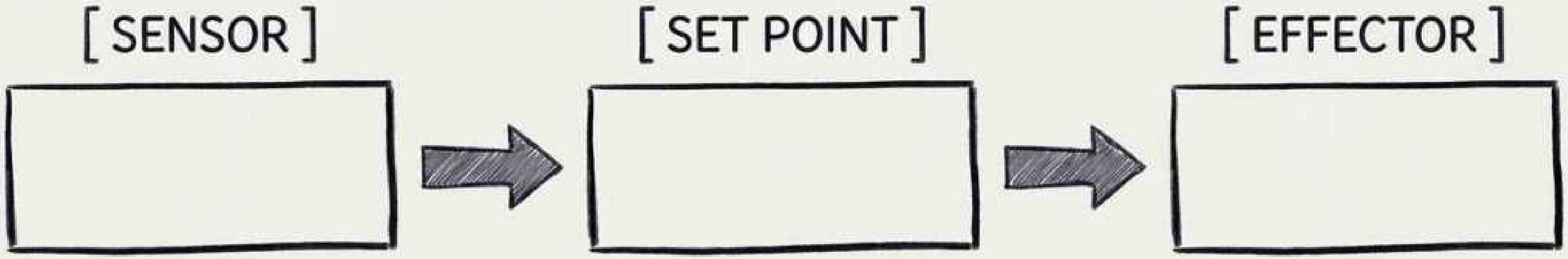
Skin vessels widen to sweat and release heat



"Physiology: A society of loops, cooperating to keep the inner world steady."

(Every system acts, and every system answers to a set point.)

Choose a symptom: Fatigue, Dizziness, or Thirst.



Which control loops might be involved?
If you can name them, you have learned
the way physiologists think.

End of Biology 110 B.

You have toured the body from cell to organ system, from signal to hormone. Be well, and stay curious.

— Anderson Academy

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