PHARM.D • YEAR 1

Medicinal Biochemistry

CHAPTER 13

Electrolytes

PPT CHAPTER COVER

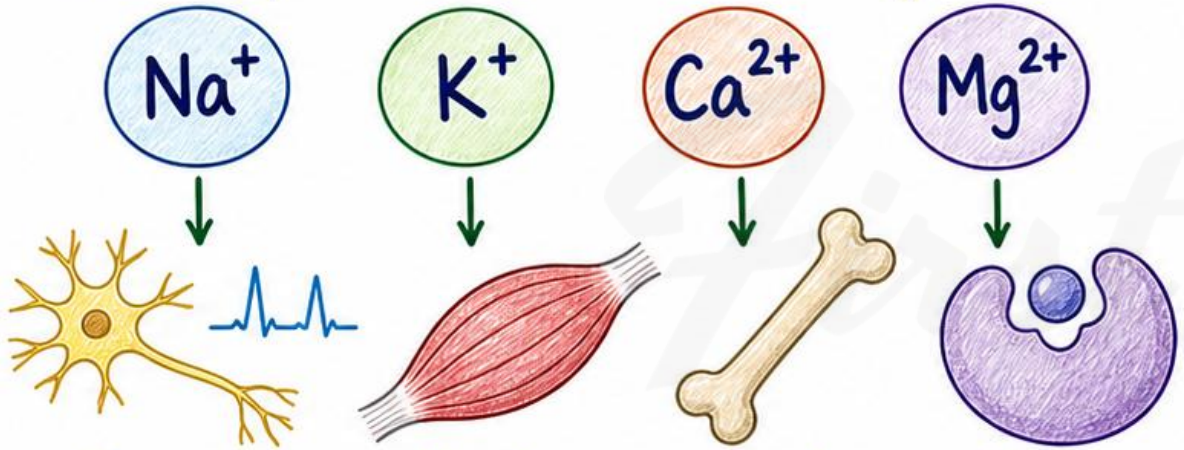


ELECTROLYTES: OVERVIEW

Electrolytes are dissolved ions that carry electrical charge in body fluids.

CATIONS (+)

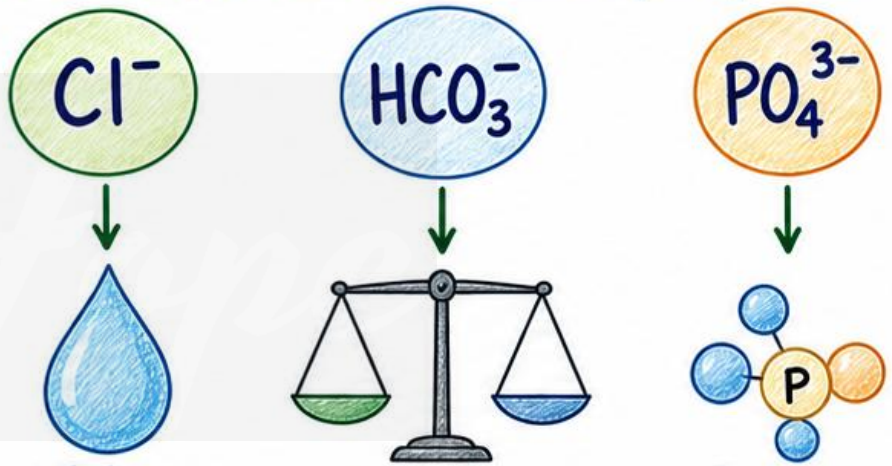
Sodium, potassium, calcium and magnesium.



Nerve signaling | Muscle contraction | Muscle contraction | Enzyme activity

ANIONS (−)

Chloride, bicarbonate and phosphate.



Water distribution | Acid–base regulation | Enzyme activity

KEY FUNCTIONS

- Nerve signaling and muscle contraction.
- Water distribution and osmotic balance.
- Acid–base regulation and enzyme activity.

→ The kidneys, hormones and cell-membrane transporters help regulate their concentrations.

→ Electrolyte results must be interpreted with the laboratory's reference intervals.

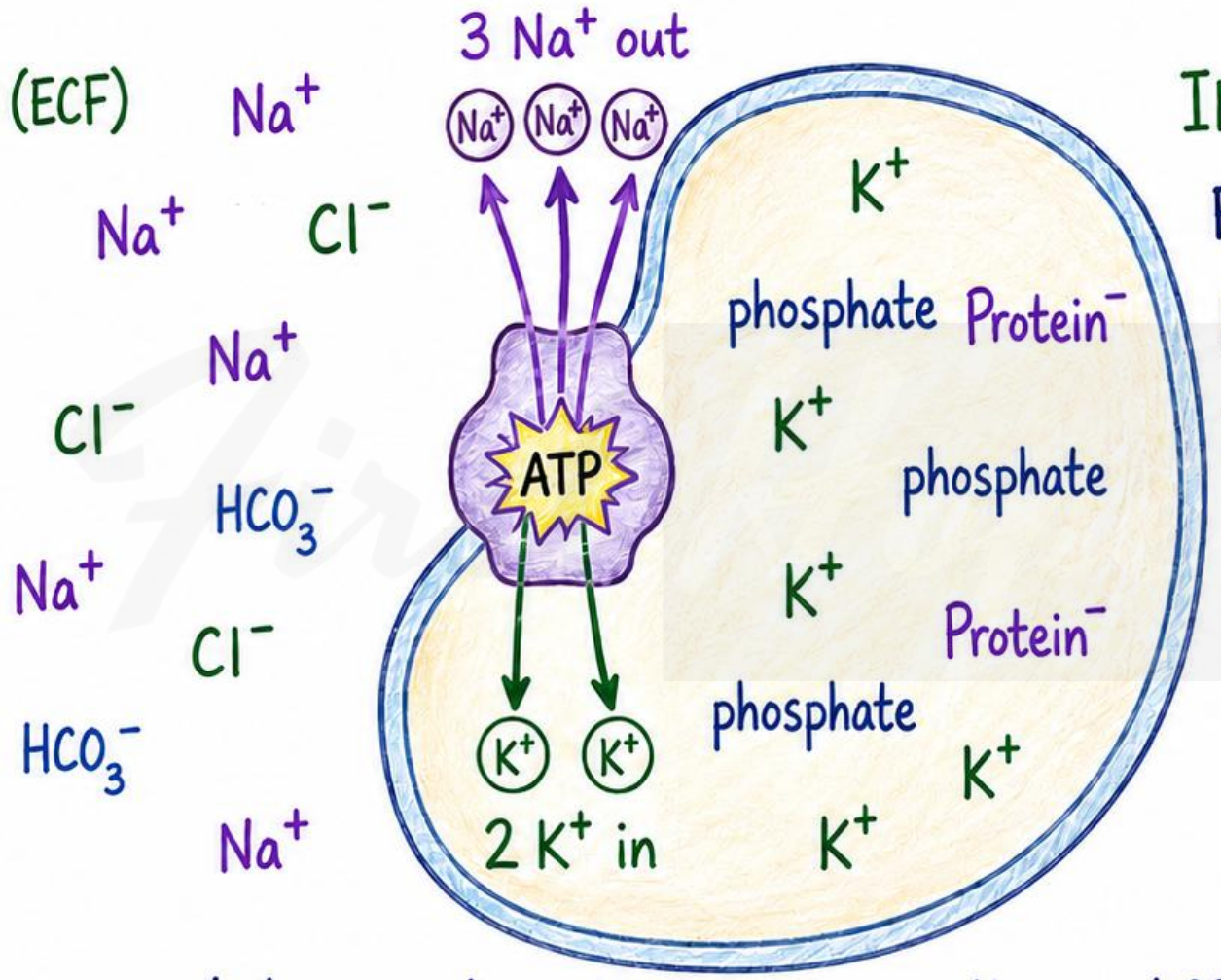
ECF vs ICF ELECTROLYTES

EXTRACELLULAR FLUID (ECF)

Fluid outside cells.

Main cation: sodium.

Major anions: chloride and bicarbonate.



INTRACELLULAR FLUID (ICF)

Fluid inside cells.

Main cation: potassium.

Important anions: phosphate and proteins.

Magnesium is also abundant inside cells.

Selective membranes and transport proteins preserve these different compositions.

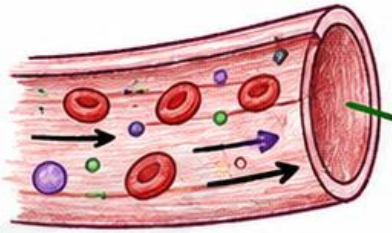
The sodium–potassium pump uses ATP to move 3 Na^+ out and 2 K^+ in per cycle.

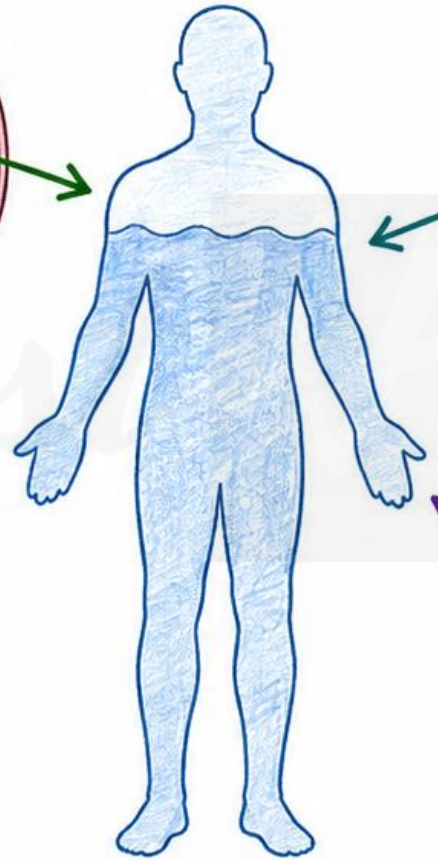
FUNCTIONS OF BODY WATER

Water provides the medium for many biochemical reactions.

TRANSPORT

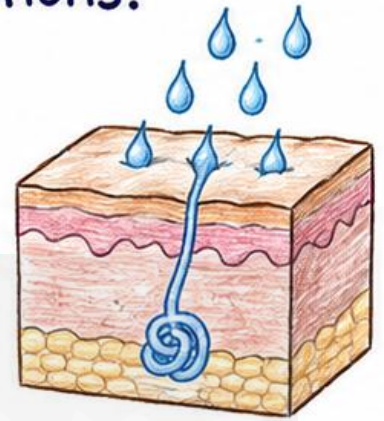
Carries nutrients, hormones and waste products.





TEMPERATURE CONTROL

Distributes heat; evaporation of sweat removes heat.



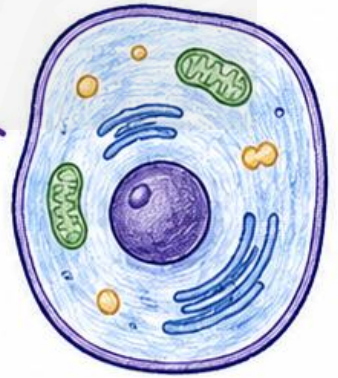
PROTECTION

Lubricates joints and cushions delicate tissues.



CELL VOLUME

Supports normal cell size and fluid balance.



Total body water varies with age and body composition.

Lean tissue contains more water than fat; infants generally have a higher water percentage than adults.

BODY-WATER COMPARTMENTS

ILLUSTRATIVE 70-kg ADULT

Total body water ≈42 L (60% of body mass).

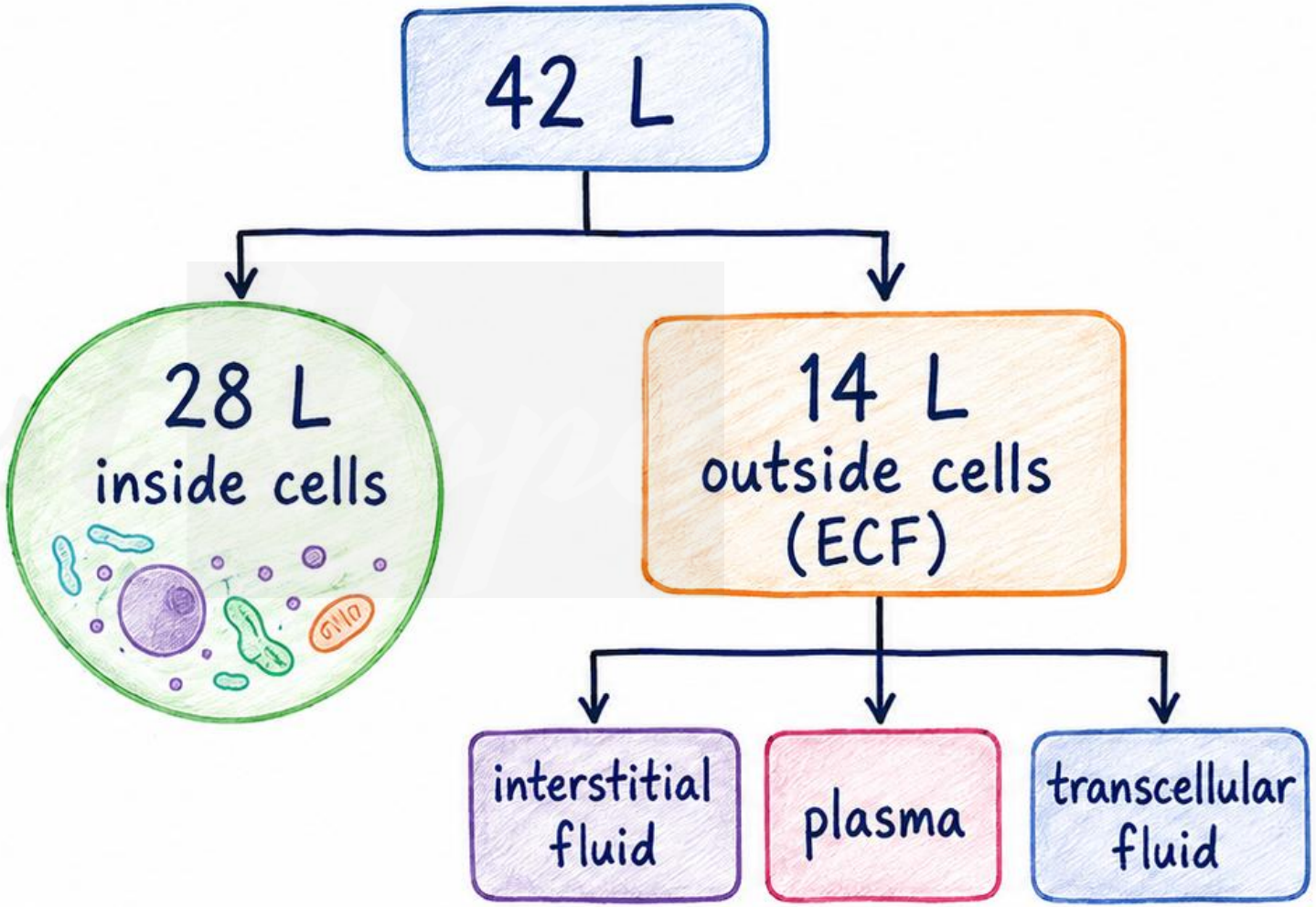
INTRACELLULAR FLUID

About two-thirds of total body water: ≈28 L.

EXTRACELLULAR FLUID

About one-third: ≈14 L.

ECF includes interstitial fluid and plasma, plus a small specialized transcellular component.



Water moves between compartments by osmosis.

These volumes are teaching estimates; age, adiposity and clinical state change them.

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