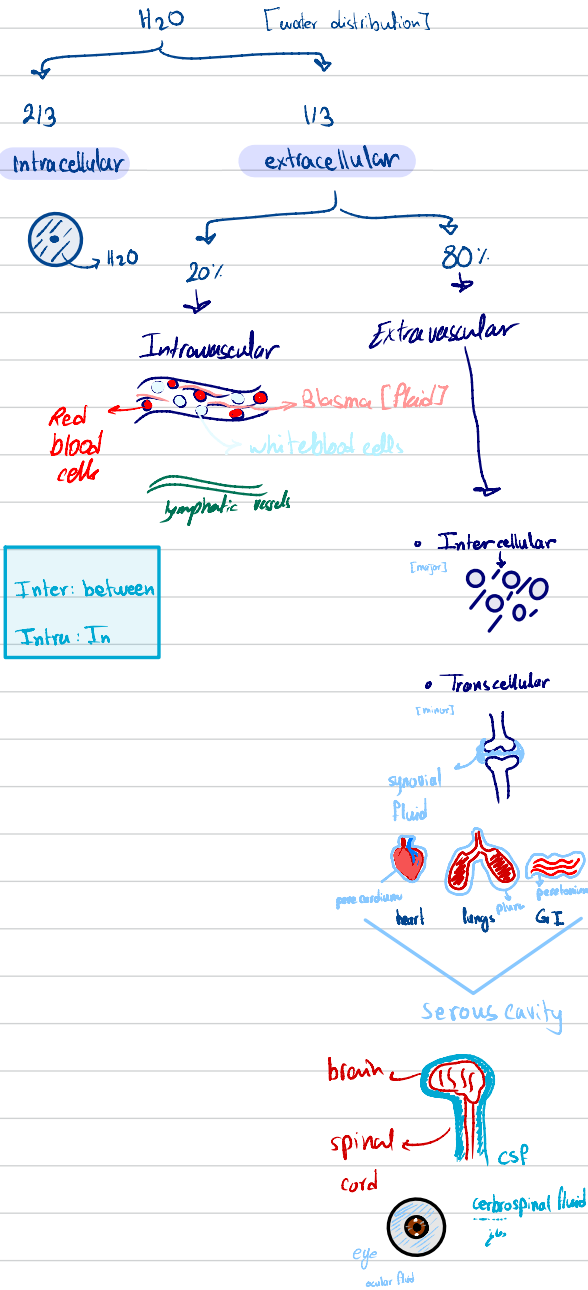


# Body fluids 1

• 60% - 55% of weight for male

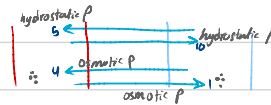


\*\*\* water movement \*\*\*



1] **Osmotic pressure** [قوة لاجبة للماء] [pull]  $\therefore \leftarrow \text{H}_2\text{O}$

2] **hydrostatic pressure** [قوة دافعة للماء] (مقدار القوة التي يجدها السائل في الجدران) [Push]

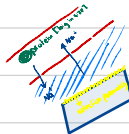


blood vessel Inter section

$$\Sigma = 10 + 1 - 4 - 5 = 2 \quad [\text{inter cellular space}]$$

\*\*\* composition \*\*\*

- **ECF:**  $\uparrow \text{Na}^+$ ,  $\uparrow \text{Cl}^-$ 
  - Intravascular:  $\uparrow$  protein
  - Extravascular:  $\downarrow$  protein
- **ICF:**  $\uparrow \text{K}^+$ ,  $\uparrow \text{PO}_4^-$ ,  $\uparrow$  protein



\*\*\* water balance \*\*\*

Input = Output

2.5      2.5  
↓          ↓

- |                   |             |   |            |
|-------------------|-------------|---|------------|
| ◦ Drinking 1.5    | ◦ Urine 1.5 | } | sensible   |
| ◦ moist food 0.75 | ◦ feces     |   |            |
| ◦ metabolism 0.25 | ◦ sweat     | } | insensible |
|                   | ◦ skin      |   |            |
|                   | ◦ breathing |   |            |

\*\*\* system of regulation \*\*\*

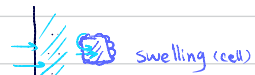
- Urinary
- cardiovascular
- Endocrine
- Respiratory

\*\*\* diseases \*\*\*

⊕ Dehydration



⊗ over hydration / pure water



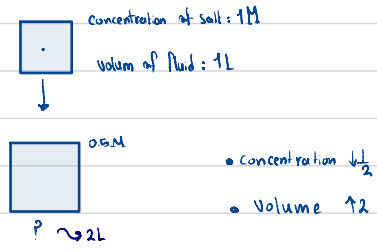
Edema (tissue) [تورم]

↓  
↳ ... update ...

\*\*\* Measurement \*\*\*

→ Dilution

$C_1 * V_1 = C_2 * V_2$



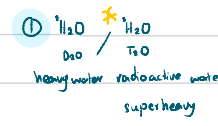
non-toxic, Rapid & easy, not metabolize or excreted, easy measure, does not affect body



1M/L ← قوتی ماده هم المرفی ترکیباً  
درست‌ترین روش

1 M/L ← { 5 M/L ←  
10 L ← {      ← (2) عیال

1] TBW



② Antipyrine (پیرین) [Pyrene]

← ...

2] Extra cellular fluid

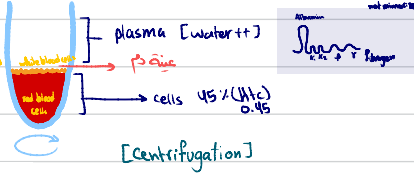
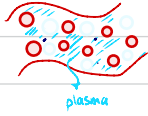
- AA Na<sup>+</sup> [Radioactive Na<sup>+</sup>]
- Iothalamate [یوتیو]
- Thio sulfate
- Inulin

3] ICF

$ICF = TBW - ECF$

## 4 plasma

- RA Albumin
- Blue



## 5 Blood cell volume

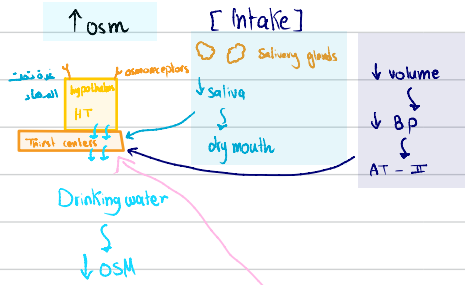
cr - dilution

## 6 Blood volume

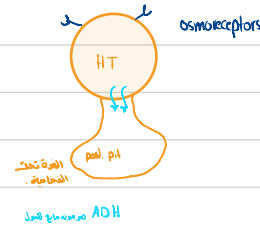
$$= \frac{\text{plasma}}{1 - Htc} = \frac{2.5}{1 - 0.45} = 5$$

## Body Fluids 2

\* Osmoregulation



[output]

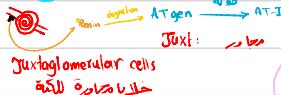


\* Regulation ECF volume

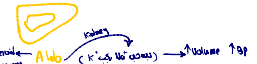
RAAS (تنظيم ضغط الدم)

↓ volume

↓ BP



Adrenal gland



↓ Renin  
↓ ACE  
↓ AT-I  
↓ Aldo } ↓ BP



ATgen

Renin  
AT-I

AT

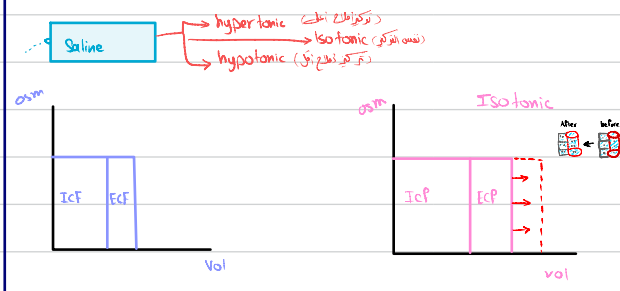
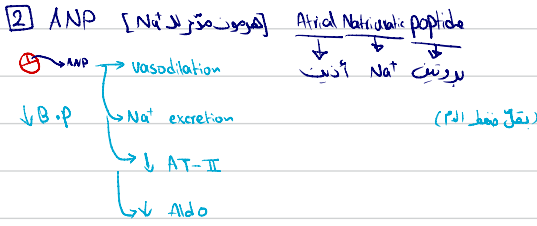
ACE



AT-II  
main functional

vasoconstriction  
↑ BP

منه  
• Angiotensin  
• Renin: الدم



⊗ Disorders

\* volumes

- Hypovolemia (↓ volume)  
 diarrhea, vomitti, hemorrhage  
 الإسهال      القيء      نزف

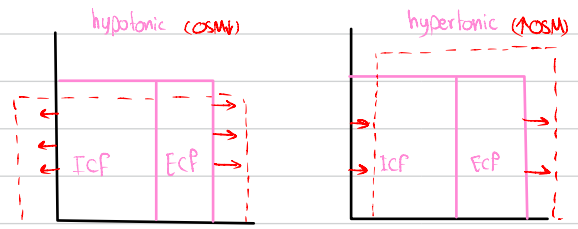
↓ ADH (Diabete Insipidus)

- Hypervolemia (↑ volume) [زيادة حجم الدم في الأوعية] [زيادة في حجم سوائل الدم]  
 [تلف في غدد الكلى] [تلف في سائل خارج الخلية]

\* Osmolarity

- Hypernatremia (↑osm)  
 → Intake Na<sup>+</sup>  
 → Intake hypertonic fluids

- Hyponatremia (↓osm)  
 → loss of Na<sup>+</sup>  
 → Intake of hypotonic fluids



\* volume & osm

- (hypovolemia)  
 • hyponatremia with dehydration  
 diarrhea, vomitti, hemorrhage  
 (hypervolemia)  
 • hyponatremia with overhydration  
 hypo saline, ↑ADH  
 • hypernatremia with dehydration  
 loss of hypo = ↓ADH  
 • hypernatremia with overhydration  
 ↑Aldo

# ⊕ Edema

⊕  $\uparrow$  cap HP

- Ⓐ  $\uparrow$  BP
- Ⓑ  $\uparrow$  venous Press
- Ⓒ vasodilation

⊕  $\downarrow$  cap oncotic

- Ⓐ  $\downarrow$  synthesis of proteins
- Ⓑ  $\uparrow$  loss of proteins

⊕  $\downarrow$  lymph drainage

- Ⓐ cancer
- Ⓑ surgery
- Ⓒ Injection
- Ⓓ genetic

⊕  $\uparrow$  permeability



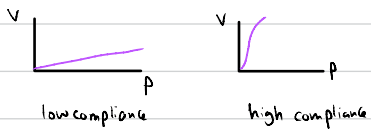
Ⓓ elephantiasis



(negative) IHP also (يسحب) lymph

# ⊕ protective mechanism

Ⓐ low compliance



Ⓑ lymph flow (x 20-30)

Ⓒ protein wash-down



