



### Renal physiology ( summary)

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اللجنة العلمية للدفعة الثالثة

طب بشري

جامعة عمران

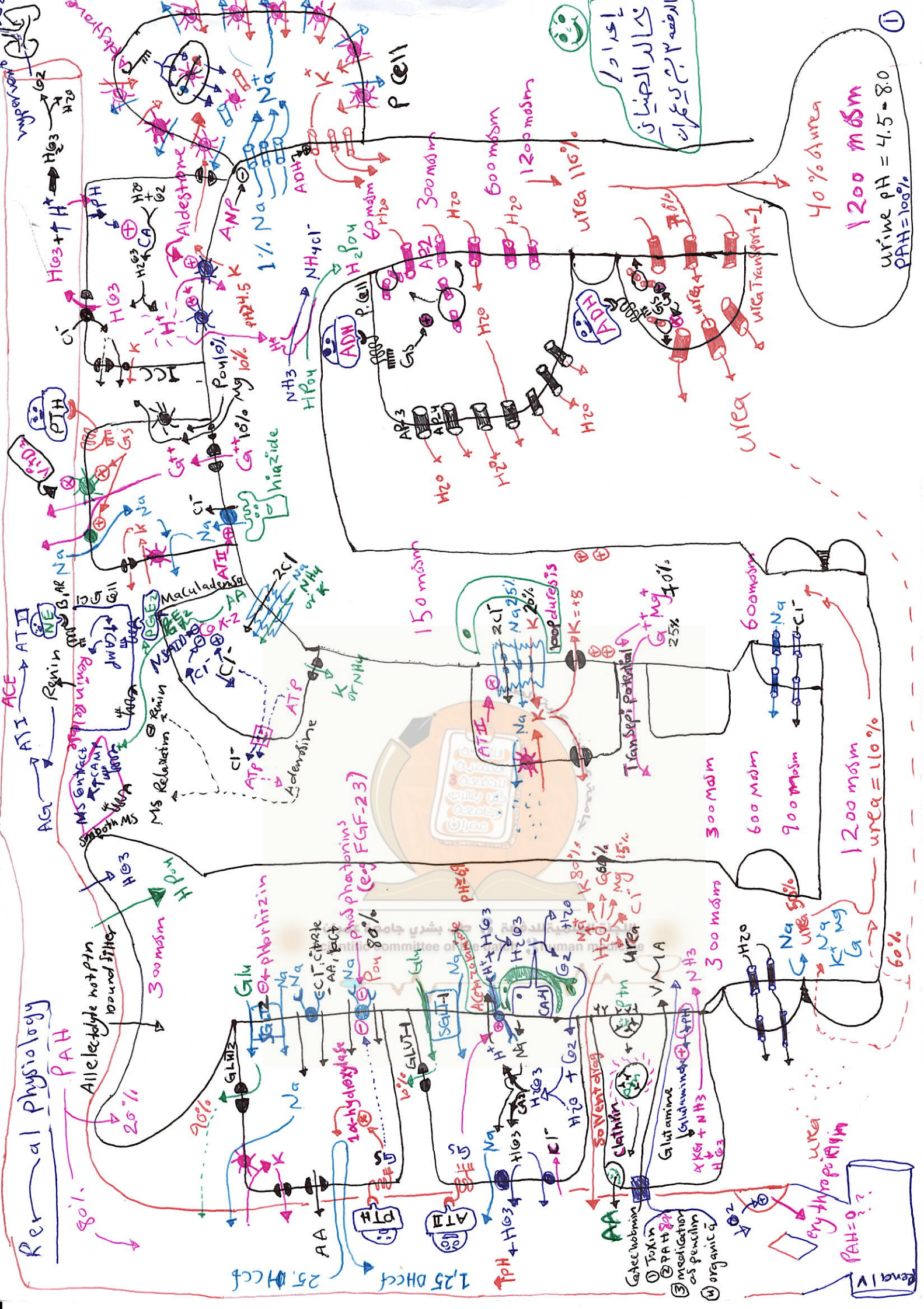
لمشاهدة محاضرة renal part 1 summary قم بالضغط على الرابط

<https://youtu.be/AGsT3dQpYYQ>

اللجنة العلمية للدفعة 3 طب بشري جامعة عمران  
scientific committee of the batch 3 human medicine

لمشاهدة فيديوهات و شروحات اللجنة العلمية زوروا قناتنا على اليوتيوب

<https://www.youtube.com/channel/UC9RzRw4eHuohHR0pzORJmVw/videos>

[illegible]

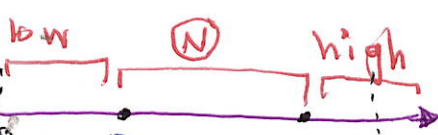




# plasma Anion gap

## Def

measurement of difference between cation & anion in plasma



- ① hyperch. metab. acidosis
- ② ↑ unmeasured anion as hyperphosphatemia
- ③ ↓ cation as hypok

## Cause

metabolic acidosis  
 $\text{H}^+ + \text{HCO}_3^- \rightarrow \text{H}_2\text{CO}_3 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$   
 proton from organic acid (lactic acid) → lactic acidosis  
 ② DKA: ↑ ketoacid ③ ingestion ethylene glycol  
 ③ methanol: ④ paint & glue: Toluene → hippuric acid

## example



solution

$$\text{Anion gap} = \text{Na} - (\text{Cl} + \text{HCO}_3)$$

$$= 1 - (0 + 1) = 0$$

Hyperchloremic metabolic acidosis \* Anion gap increase

Diarrhea →  $\text{HCO}_3^-$  lost in stool  
 Renal tubular acidosis →  $\text{HCO}_3^-$  lost in urine  
 Kidney reabsorb  $\text{Cl}^-$  so AG remain (N) normal  

$$\text{AG} = \text{Na} - (\uparrow \text{Cl} + \downarrow \text{HCO}_3) = \text{N}$$

## Function

Represent unmeasured anions

Albumin  
 organic  
 Cation

- Na
- $\text{K}^{2+}$
- $\text{Ca}^{2+}$
- $\text{Mg}^{2+}$
- $\text{O}^{+}$  ptn

## Substance

Anion

- $\text{Cl}^-$
- $\text{BCO}_3$
- $\text{PO}_4^{3-}$
- sulfate
- $\text{O}^{+}$  ptn as Albumin
- organic

## Example

metabolic alkalosis  
 - DKA: ↑ ketoacid  
 mild AG w/ other than metabolic acidosis is in nonketotic hypoglycemia

On also urine AG use  
 urine AG = un

## Measurement

\* major +ve is Na = 137 mEq/L  
 \* major -ve is  $\text{Cl}^-$  = 104 mEq/L  
 \*  $\text{HCO}_3^-$  = 24 mEq/L  
 this 3 anions we take gap b/w 3 conc in plasma

$$137 - (104 + 24) = 9 \text{ mEq/L}$$

Essentially All Cation  
 Ignored some anions e.g organic  $\text{O}^{+}$  ptn



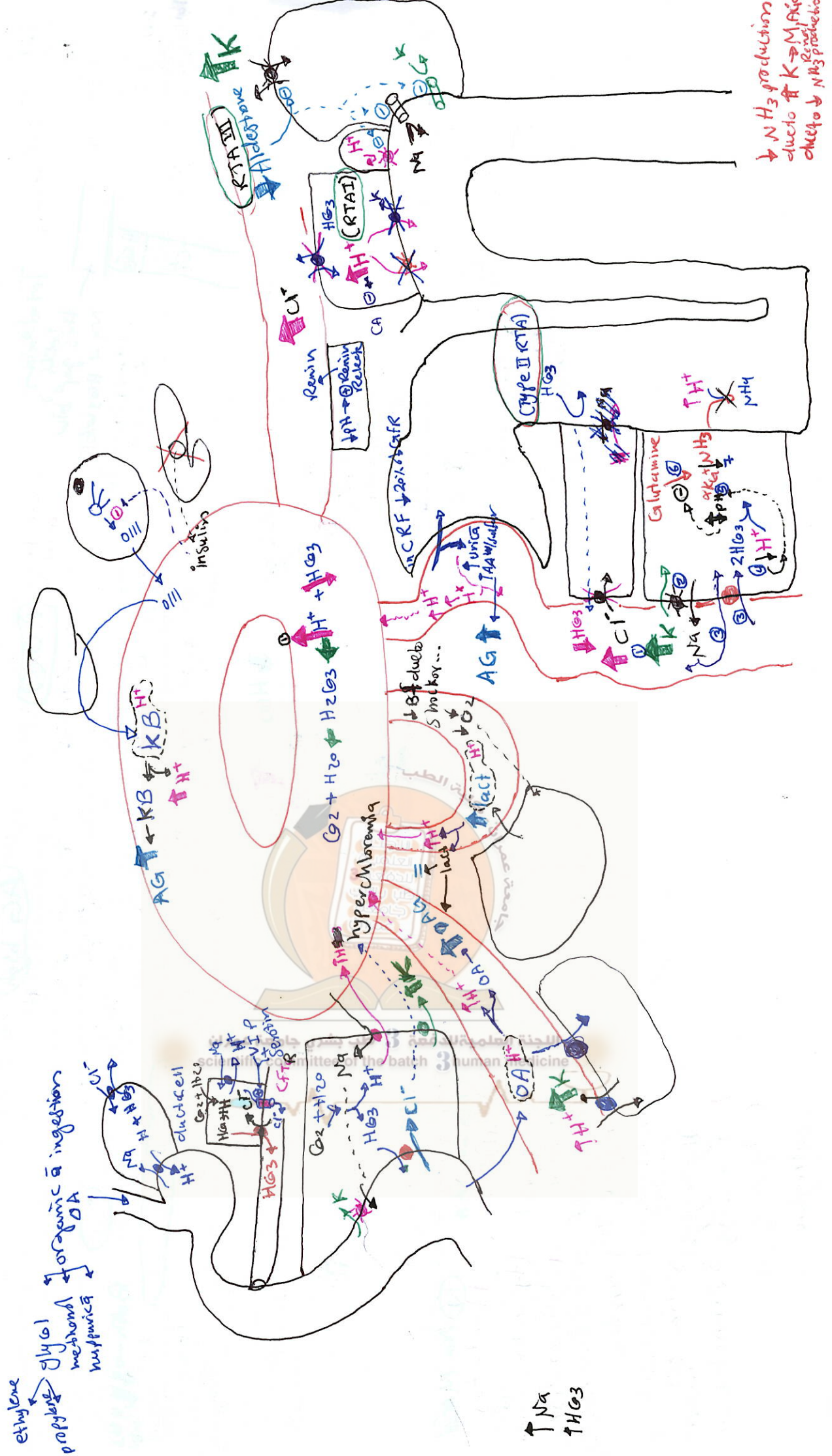












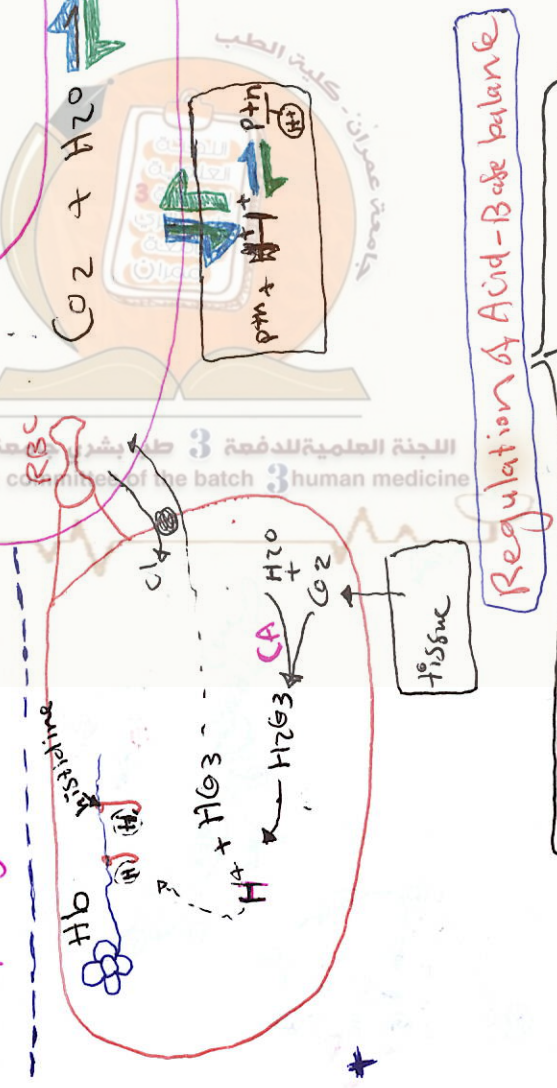


④ ↑ Respiratory Rate & depth  
 ↳ ↑ minute ventilation [vol of air entering/exiting]  
 ↳ elimination of  $\text{CO}_2 \rightarrow \downarrow \text{H}^+ (\text{pH})$   
 This is a feedback mechanism to compensate for **Respiratory acidosis**



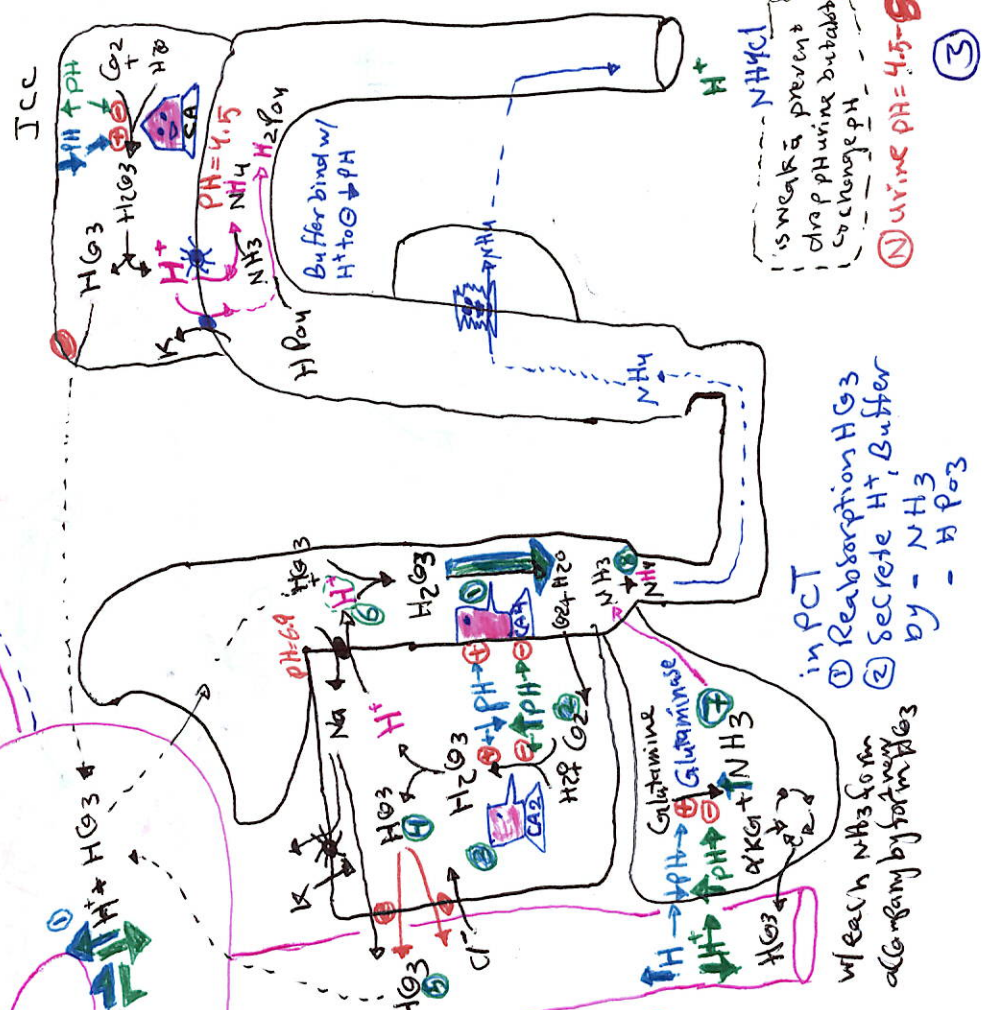
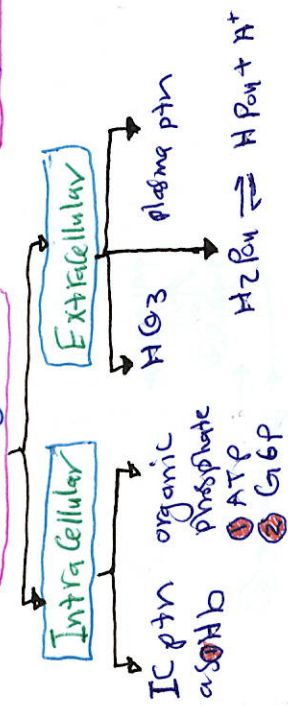
① ↓  $\text{H}^+$  → ↓ Resp Rate & depth  $\text{CO}_2$   
 ↳ ↓ Minute Ventilation → ↑  $\text{H}^+$  (Normal pH)  
 ↳ prevent  $\text{CO}_2$  expire rapidly → this process is compensation of **Respiratory alkalosis**

Single ptn on act as Acid or Base  
 $\text{COOH} \rightleftharpoons \text{COO}^- + \text{H}^+$   
 weak base bind w/  $\text{H}^+$  to prevent ↓ pH  
 Plasma ptn (limited buffer)



**Regulation of Acid-Base balance**

- Buffer System
- Respiratory Compensation
- Renal Compensation



in PCT  
 ① Reabsorption  $\text{HCO}_3^-$   
 ② secrete  $\text{H}^+$  Buffer by -  $\text{NH}_3$   
 w/ each  $\text{NH}_3$  form accompany by  $\text{Na}^+$  or  $\text{K}^+$   
 is weak & prevent drop pH urine but able to change pH  
 ② urine pH = 4.5-5  
 ③



## Metabolic Alkalosis

