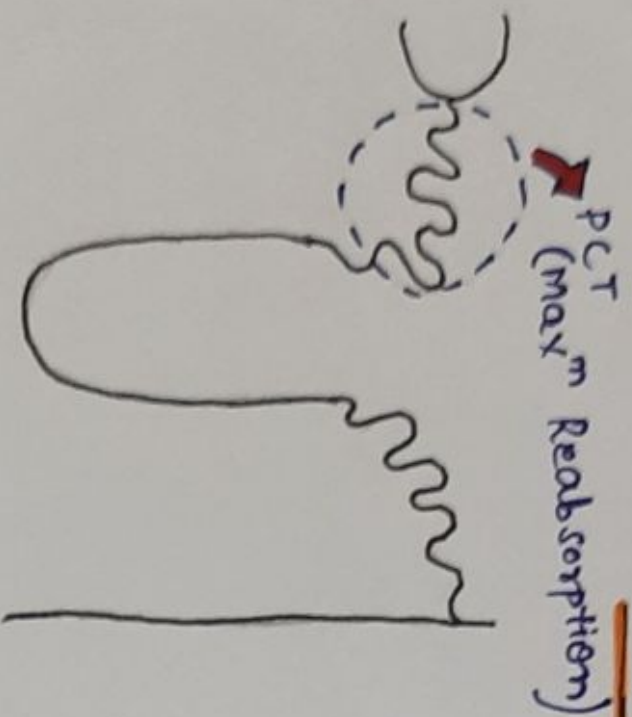
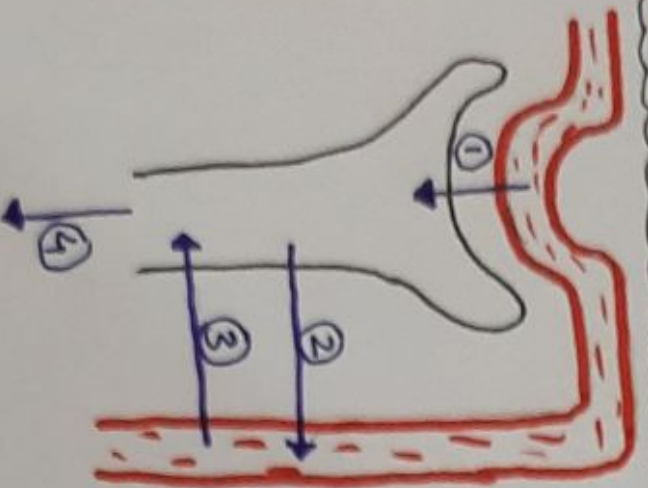


PROXIMAL TUBULE



- PCT
- LOH
- DCT
- Collecting tubule
- Collecting duct

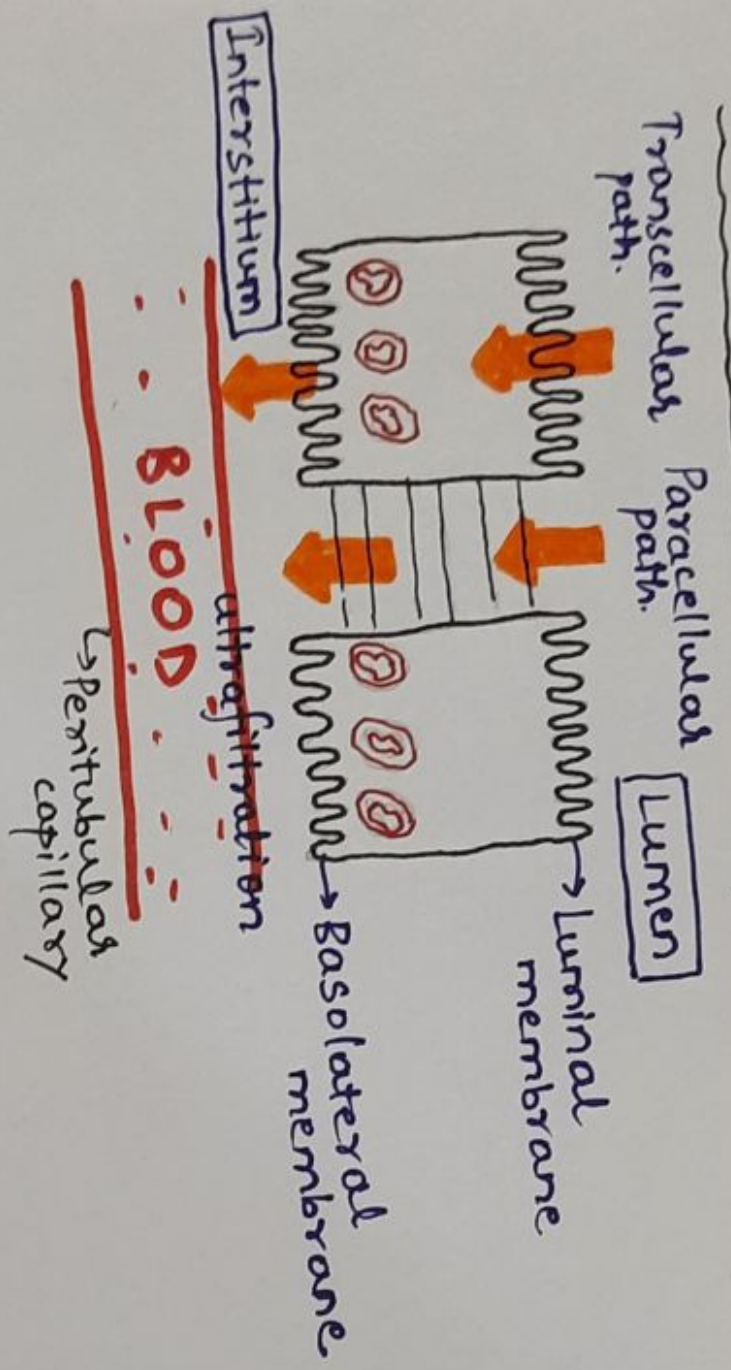
Basic Renal processes:-



- ① Glomerular filtration
- ② Tubular Reabsorption
- ③ Tubular Secretion
- ④ Urinary Excretion

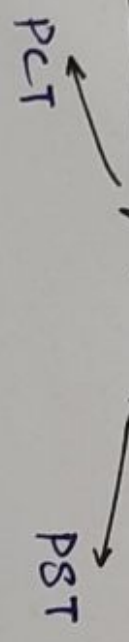
$$\boxed{\text{Excretion} = \text{Filtration} - \text{Reabsorption} + \text{Secretion}}$$

Proximal tubule :-



- Cells of Proximal tubule
- * Microvilli → ↑ S.A.
 - * Mitochondria → provides for energy for 'ACTIVE' transport.
 - * Leaky tight junction

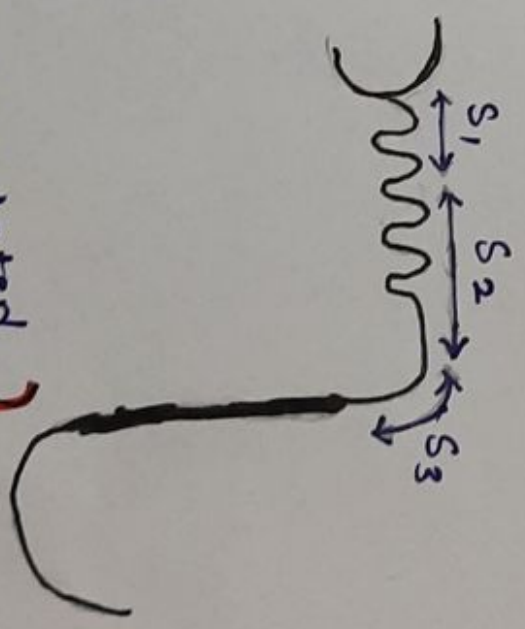
Components of proximal tubule



Segments :-

- S₁ = First half of PCT
- S₂ = Second half of PCT + First half of PST
- S₃ = Second half of PST

{ PCT :- Proximal convoluted tubule
PST :- Prox. straight tubule }



Reabsorption in Proximal tubule

→ Maximum Reabsorption

→ Na^+	:- $\frac{2}{3}$ rd (67%)
→ H_2O	:- $\frac{2}{3}$ rd (67%)
→ K^+	:- $\frac{2}{3}$ rd (67%)
→ Phosphate	:- 80%
→ HCO_3^-	:- 80%
→ Glucose	:- 100%
→ Amino Acid	:- 100%

{ Complete Reabsorption }

Na^+ Reabsorption :-

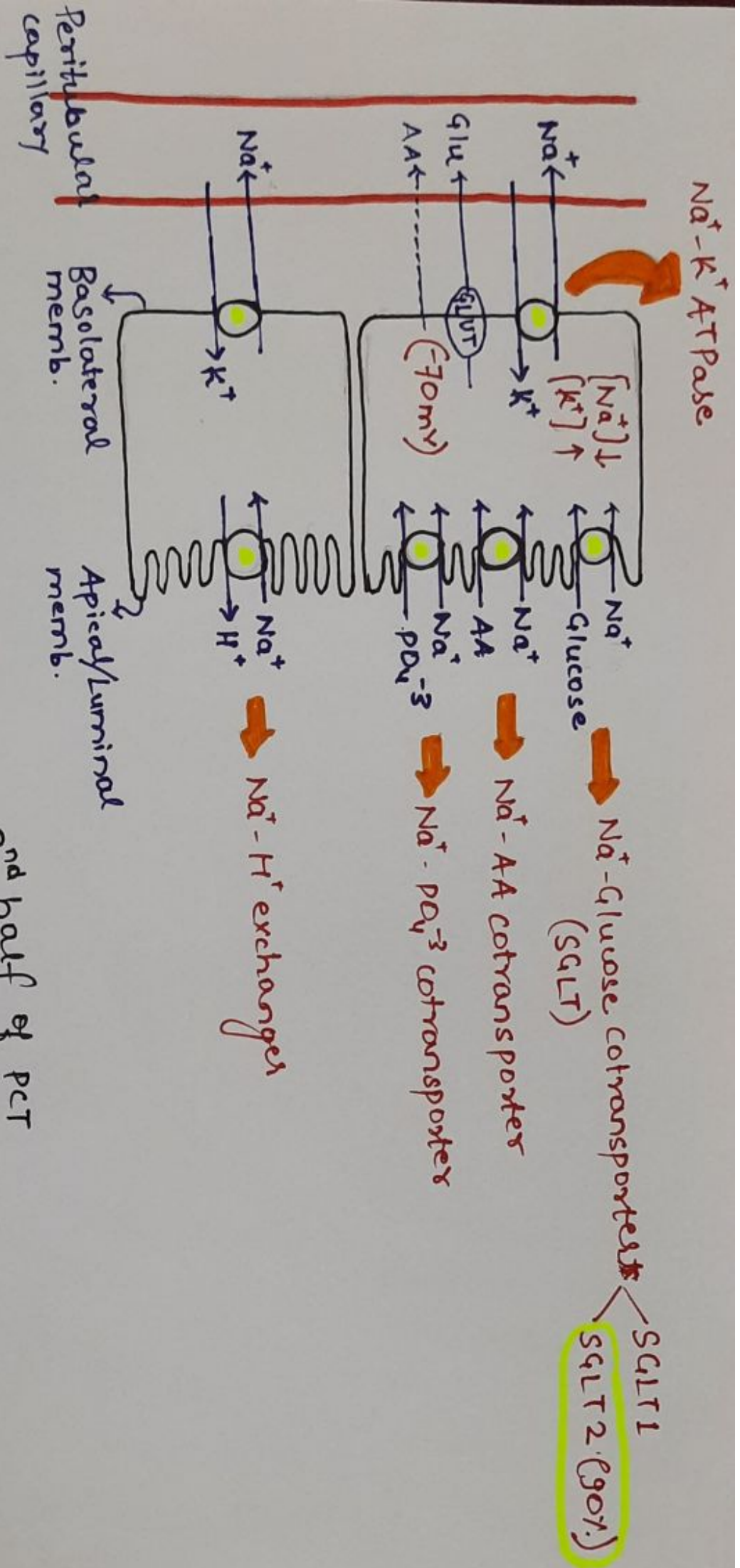
In Basolateral membrane

* $\text{Na}^+ - \text{K}^+$ ATPase } → Primary Active Transport

→ Secondary Active Transport

In Luminal memb.

- * Na^+ - Glucose cotransporter
- * Na^+ - AA cotransporter
- * Na^+ - PO_4^{3-} cotransporter
- * $\text{Na}^+ - \text{H}^+$ exchanger



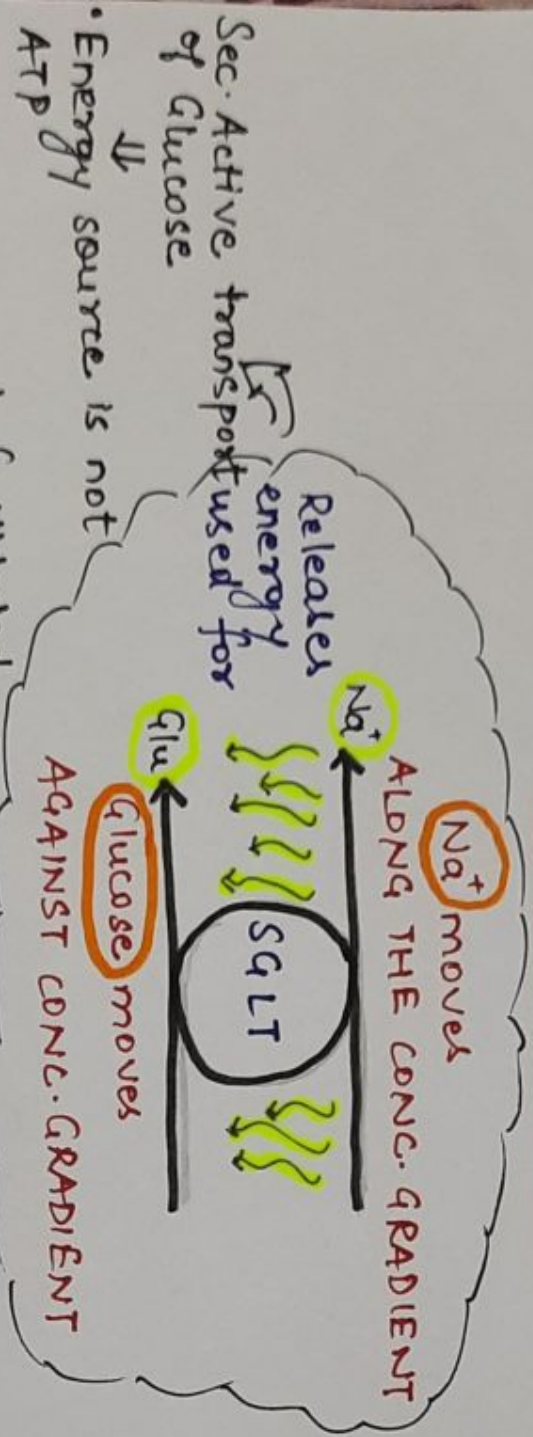
- 1st half of PCT
- Na⁺ is reabsorbed along with Glucose, AA, PO₄⁻³
 - Cl⁻ increases in lumen of tubules

- 2nd half of PCT
- Na⁺ is reabsorbed along with Cl⁻

Na⁺K⁺ ATPase

- Na⁺ out to interstitium
- K⁺ into the cell

Intracellular
[Na⁺] ↓
[K⁺] ↑
(-70 mV charge)



- Energy source is not ATP
- Energy source is facilitated diffusion of another transported substance along conc. gradient.

H₂O Reabsorption :-

→ Reabsorption along with Na⁺ by osmosis

Na⁺ + H₂O reab.
in equal amount
⇒ ISOTONIC

① Passive diffusion of Na⁺ across luminal membrane

d/t ← conc. grad. → d/t
-70 mV attracts positive Na⁺

② Facilitated diffusion through carrier molecules
• SGLT (Na⁺-Glu cotransporter)
• Na⁺-AA cotransporter
• Na⁺-PO₄³⁻ cotransporter

At Basolateral memb;

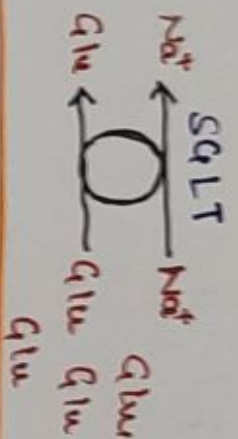
* Gluc. exits through GLUT

GLUT2 (S₁) → GLUT1 (S₃)

* AA exits through diffusion

Transport Maximum for Glucose :-

Maximum rate at which solute can be transported

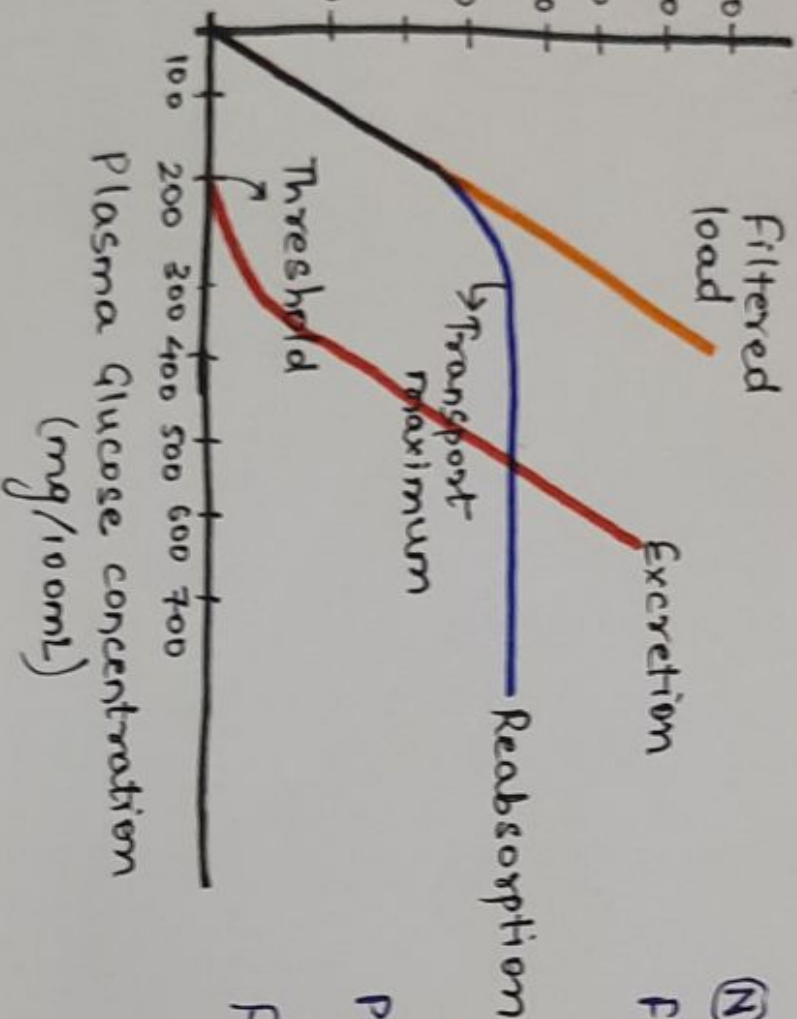


Amount of solute delivered to tubule > Capacity of carrier protein (Tubular load)

⇒ Transport maximum is reached.

375 mg/min

Glucose Filtered load, Excretion, Reabsorption (mg/min)



Normal;

(N) plasma glu. conc = 100 mg/dl
Filtered load normal = 125 mg/min

↓
No loss of glucose in urine

Plasma glu. conc = 200 mg/dl (Threshold)

Filtered load = 250 mg/dl

↓
Small amount of glucose appears in urine

'SPLAY' :- Appearance of glucose in urine (THRESHOLD) occurs before transport maximum is reached

Reason :- Not all nephrons have same transport maximum for glucose
 $\therefore$ Overall transport maximum for kidneys (375 mg/min), is reached when all nephrons have reached their maximum capacity to reabsorb glucose

PCT secretion :-

- PAH
- H^+ ($Na^+ - H^+$ exchanges)
- Bile salts
- Urate