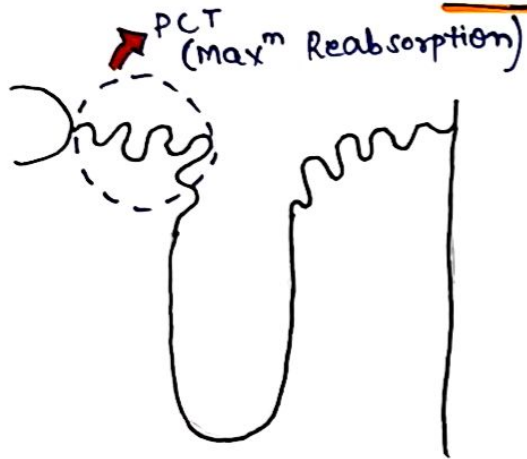
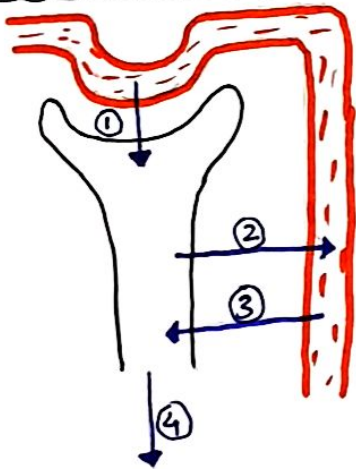


PROXIMAL TUBULE



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

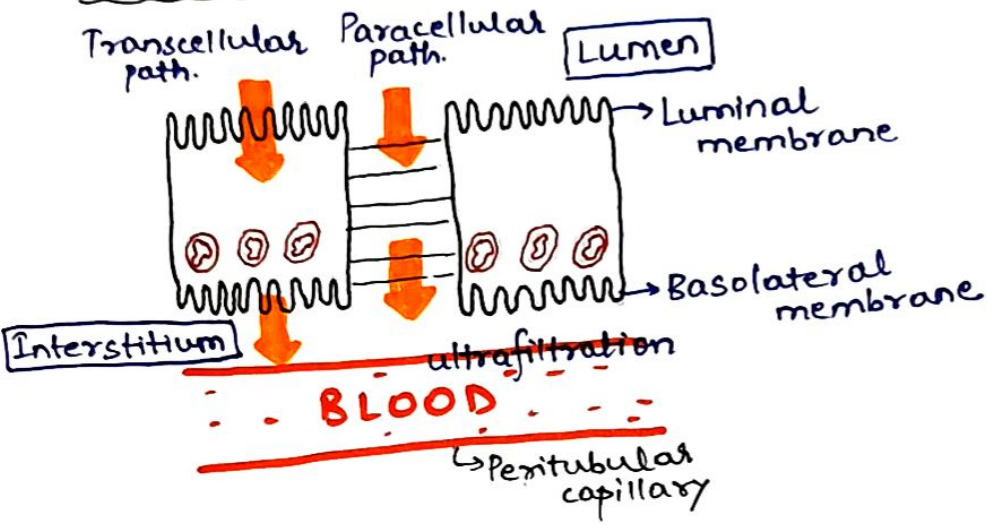
Basic Renal processes:-



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

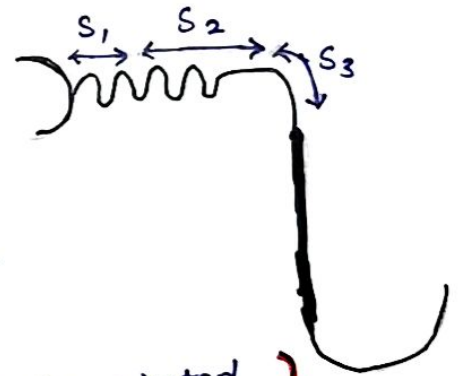
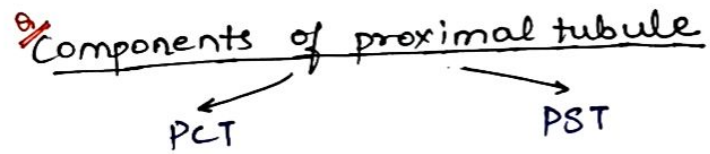
$$\boxed{\text{Excretion} = \text{Filtration} - \text{Reabsorption} + \text{Secretion}}$$

Proximal tubule :-



Cells of Proximal tubule

- * Microvilli → ↑ S.A.
- * Mitochondria → provides energy for 'ACTIVE' transport.
- * Leaky Tight junction



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

{ Complete Reabsorption }

Na^+ Reabsorption :-

In Basolateral membrane

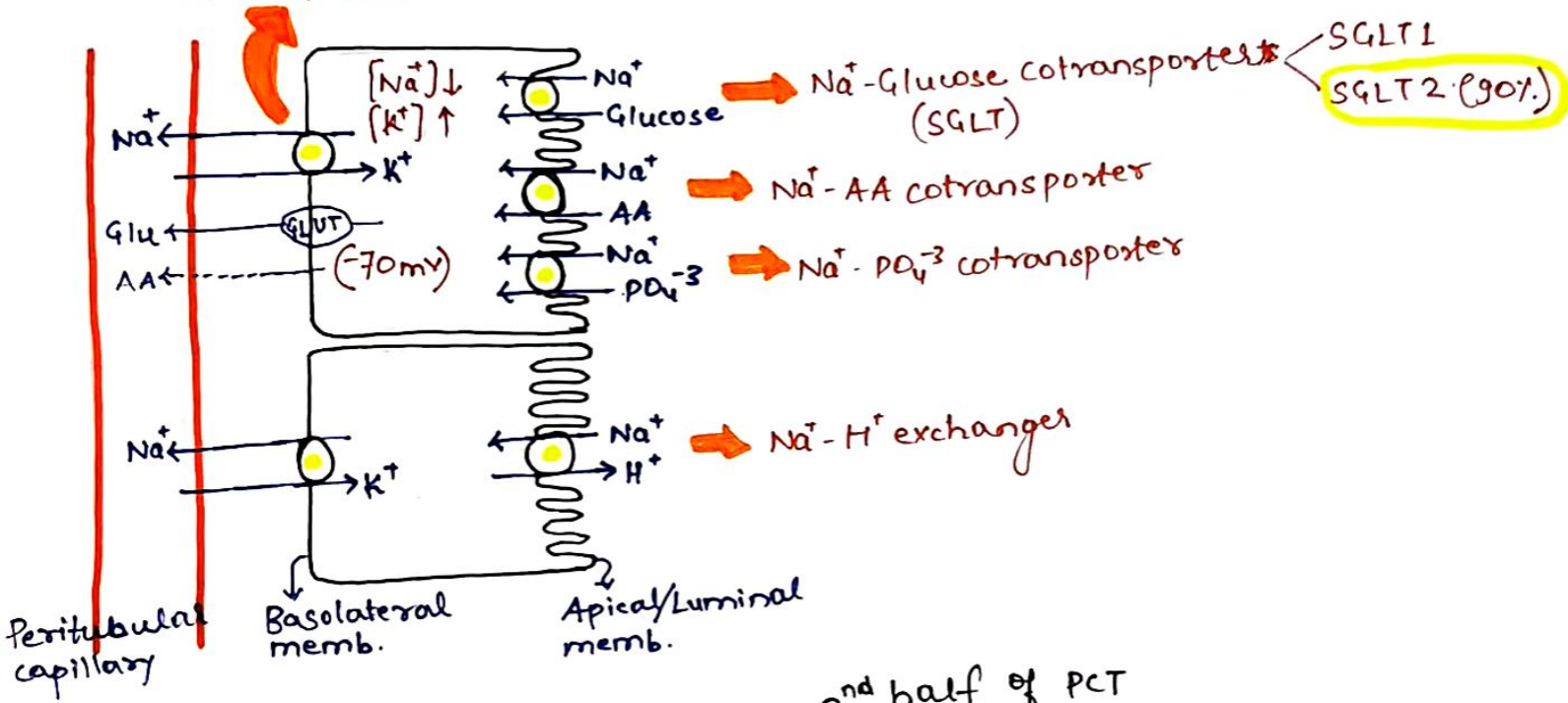
* $\text{Na}^+ - \text{K}^+$ ATPase } → Primary Active Transport

⊖ Secondary Active Transport

In Luminal memb.

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

Na⁺-K⁺ ATPase



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⁻

$\text{Na}^+ \text{K}^+ \text{ATPase}$

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

Intracellular
 $[\text{Na}^+] \downarrow$
 $[\text{K}^+] \uparrow$
(-70 mV charge)

① Passive diffusion of Na^+ across luminal membrane

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

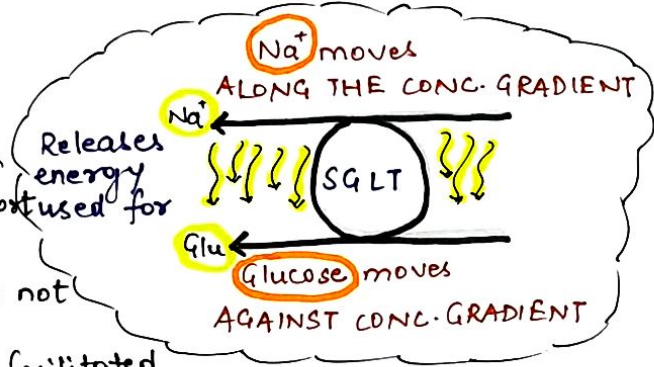
② Facilitated diffusion through carrier molecules

- SGLT (Na^+ -Glu cotransporter)
- Na^+ -AA cotransporter
- Na^+ - PO_4^{3-} cotransporter



At Basolateral memb;

- Gluc. exits through GLUT
GLUT2 (S₁) GLUT1 (S₃)
- AA exits through diffusion



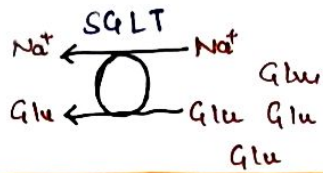
Sec. Active transport of Glucose

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

H_2O Reabsorption :-
↳ Reabsorption along with Na^+ by osmosis
 $\text{Na}^+ + \text{H}_2\text{O}$ reab. in equal amount ⇒ ISOTONIC

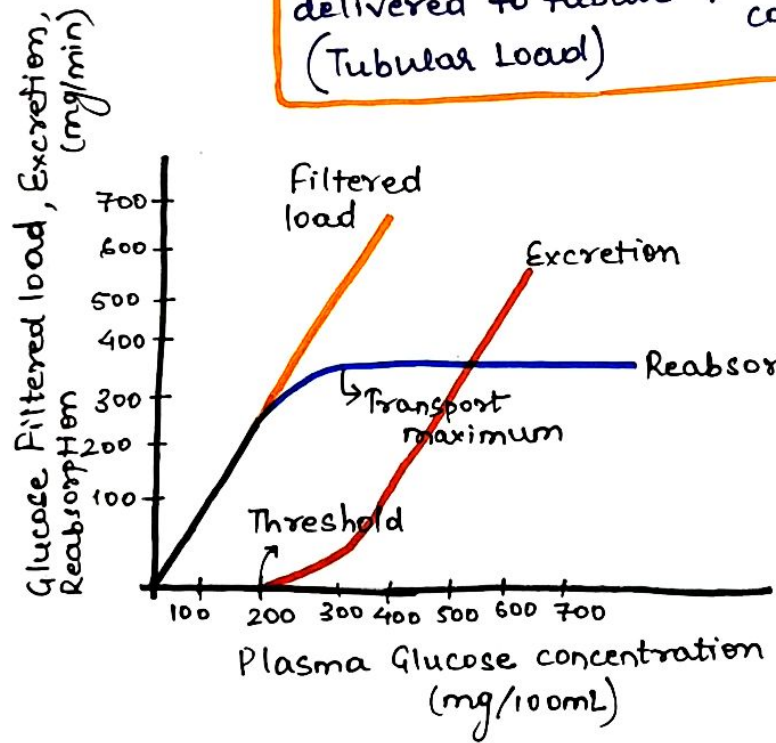
Transport Maximum for Glucose :-

Maximum rate at which solute can be transported



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

⇒ Transport Maximum is reached.
= 375 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

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

Q Reason :- Not all nephrons have same transport maximum for glucose

∴ 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^+ ($Na^+ - H^+$ exchanger)
- Bile salts
- Urates