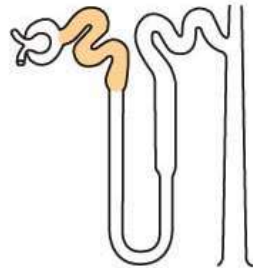


TUBULE SEGMENT	SUBSTANCE REABSORBED	MECHANISM
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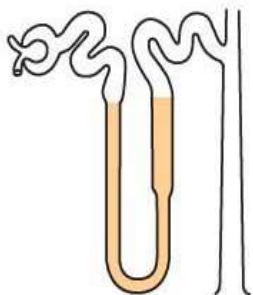
**Proximal Convoluted Tubule**



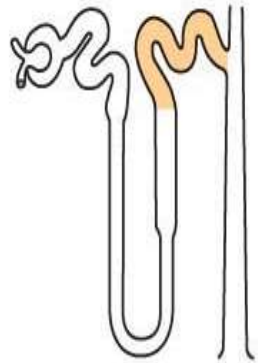
Sodium ions ( $\text{Na}^+$ )	Primary active transport via basolateral $\text{Na}^+$ - $\text{K}^+$ pump; sets up electrochemical gradient for passive solute diffusion, osmosis, and secondary active transport (cotransport) with $\text{Na}^+$
Virtually all nutrients (glucose, amino acids, vitamins)	Secondary active transport with $\text{Na}^+$
Cations ( $\text{K}^+$ , $\text{Mg}^{2+}$ , $\text{Ca}^{2+}$ , and others)	Passive paracellular diffusion driven by electrochemical gradient
$\text{Cl}^-$	Passive paracellular diffusion driven by electrochemical gradient
$\text{HCO}_3^-$	Secondary active transport linked to $\text{H}^+$ secretion and $\text{Na}^+$ reabsorption (see Chapter 26)
Water	Osmosis; driven by solute reabsorption (obligatory)
Lipid-soluble solutes	Passive diffusion driven by the concentration gradient created by reabsorption of water
Urea	Passive paracellular diffusion driven by chemical gradient; some transcellular facilitated diffusion may also occur
Small proteins	Endocytosed by tubule cells and digested to amino acids within tubule cells

**Loop of Henle**

Descending limb	Water	Osmosis
Ascending limb	$\text{Na}^+$ , $\text{Cl}^-$ , $\text{K}^+$	Secondary active transport of $\text{Cl}^-$ , $\text{Na}^+$ , and $\text{K}^+$ via $\text{Na}^+$ - $\text{K}^+$ - $2\text{Cl}^-$ cotransporter in thick portion; paracellular diffusion; $\text{Na}^+$ - $\text{H}^+$ antiport
	$\text{Ca}^{2+}$ , $\text{Mg}^{2+}$	Passive paracellular diffusion driven by electrochemical gradient



## Distal Convoluted Tubule



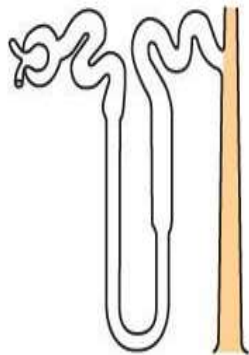
$\text{Na}^+$ ,  $\text{Cl}^-$

Primary active  $\text{Na}^+$  transport at basolateral membrane; secondary active transport at luminal membrane via  $\text{Na}^+$ - $\text{Cl}^-$  symporter and channels; aldosterone-regulated at distal portion

$\text{Ca}^{2+}$

Passive uptake via PTH-modulated channels in luminal membrane; primary and secondary active transport (antiport with  $\text{Na}^+$ ) in basolateral membrane

## Collecting Duct



$\text{Na}^+$ ,  $\text{H}^+$ ,  $\text{K}^+$ ,  $\text{HCO}_3^-$ ,  $\text{Cl}^-$

Primary active transport of  $\text{Na}^+$  (requires aldosterone); passive paracellular diffusion of some  $\text{Cl}^-$ ; cotransport of  $\text{H}^+$ ,  $\text{Cl}^-$ , and  $\text{HCO}_3^-$ ;  $\text{K}^+$  is both reabsorbed and secreted (aldosterone dependent), usually resulting in net  $\text{K}^+$  secretion

Water

Osmosis; controlled (facultative) water reabsorption; ADH required to insert aquaporins

Urea

Facilitated diffusion in response to concentration gradient in the deep medulla region; recycles and contributes to medullary osmotic gradient