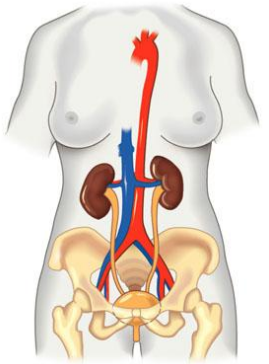
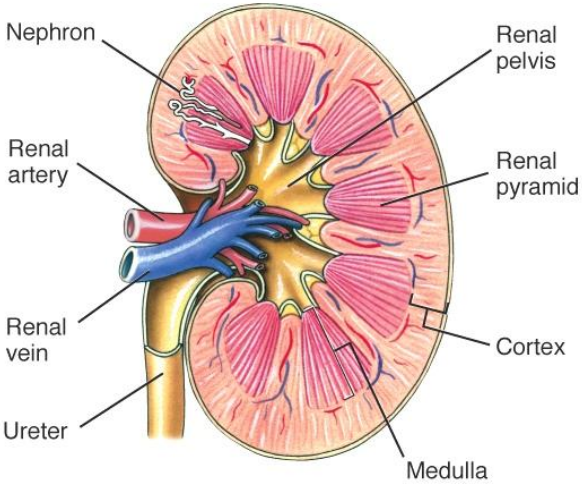
SISTEM EKSKRESI

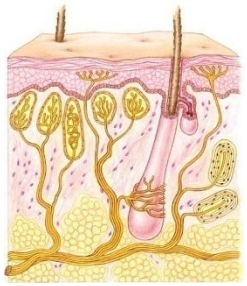
Kompetensi

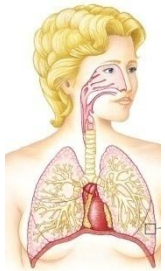
Memahami mekanisme pengeluaran zat buangan dan pengaturan cairan tubuh

Suatu sistem organ yang memungkinkan material tertentu dikeluarkan dari tubuh agar terjadi keseimbangan cairan



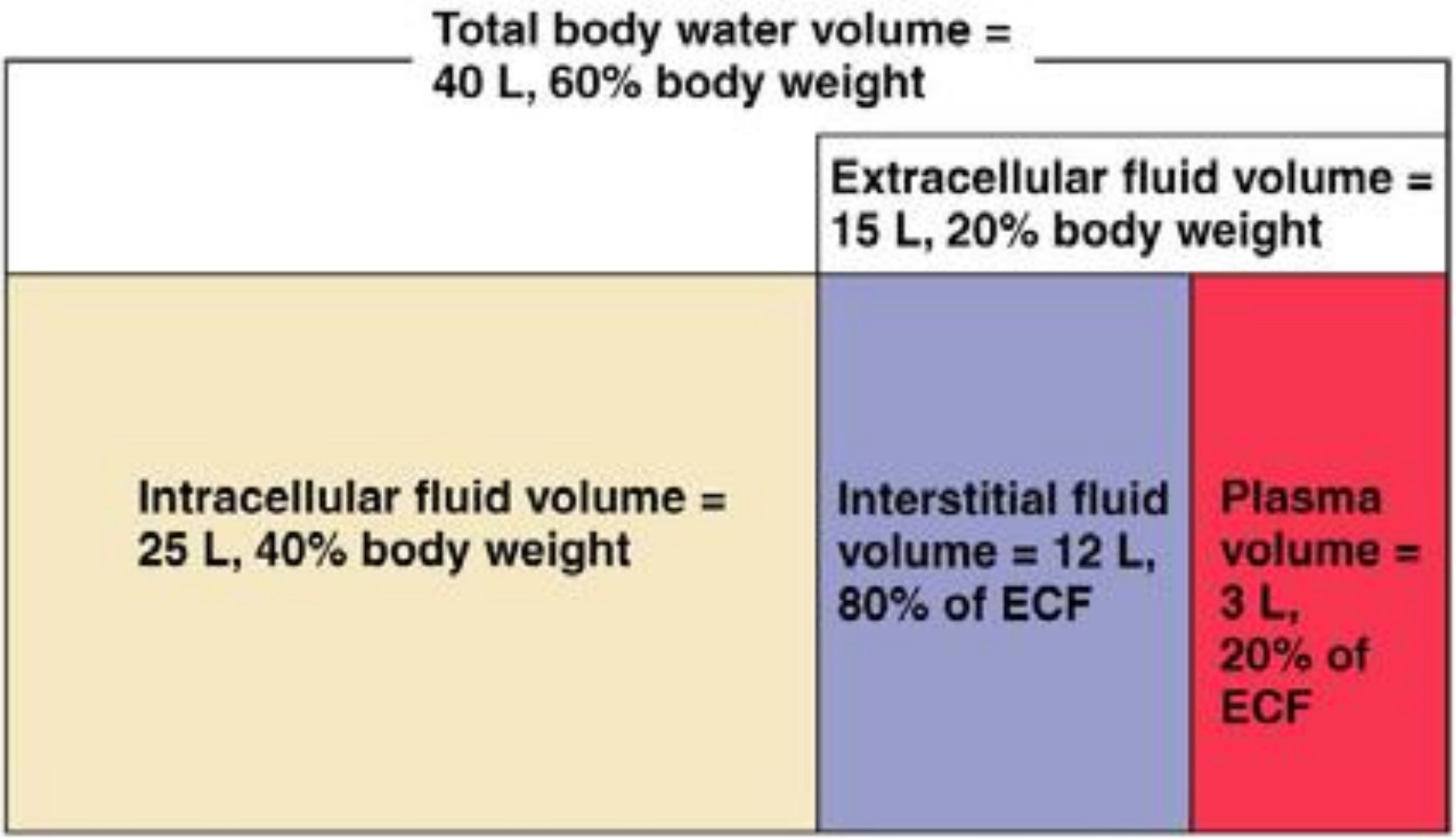






EXIT

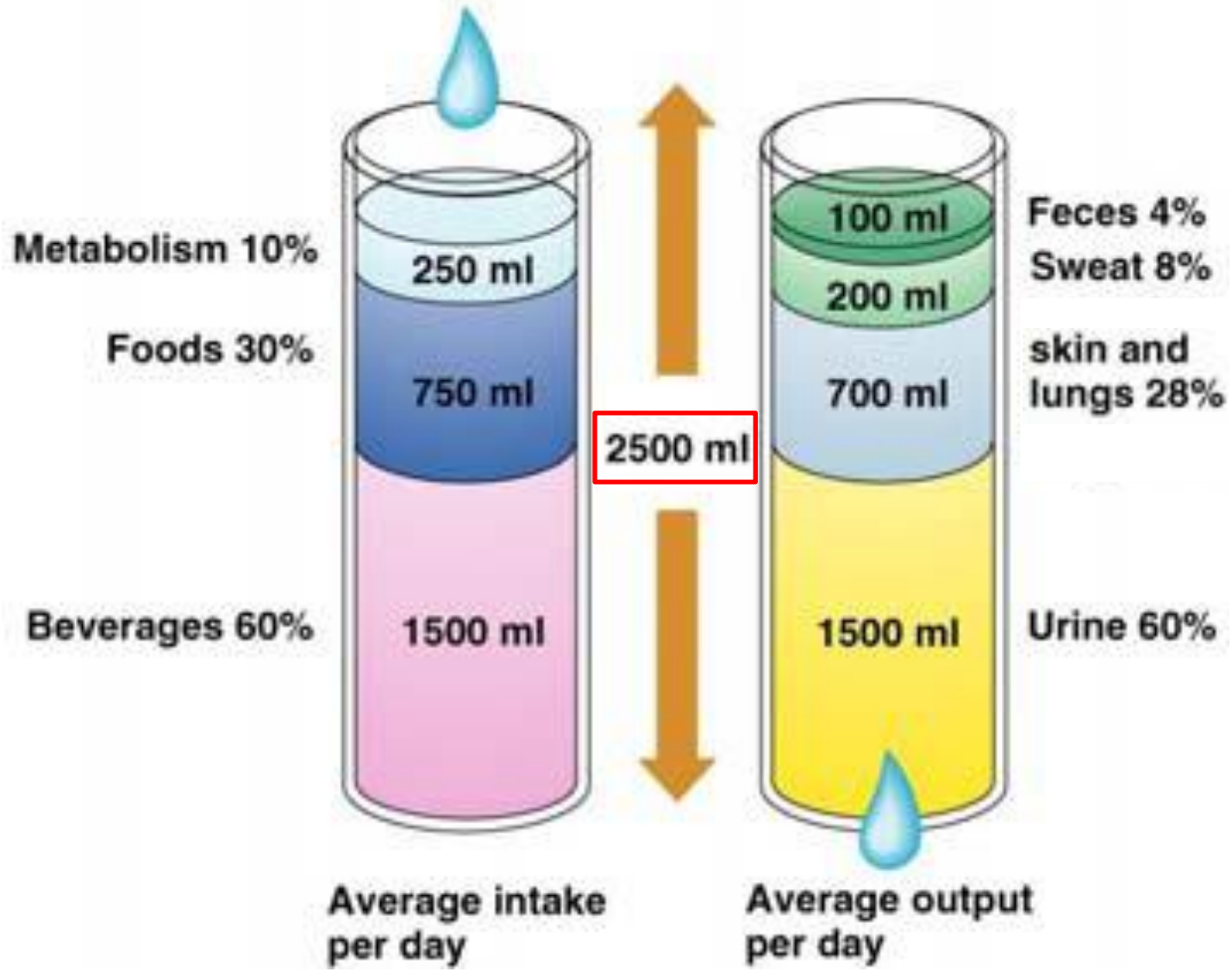
KONDISI CAIRAN TUBUH MANUSIA



Pada orang tua, cairan tubuh hanya 45% dari total berat badan

KONDISI CAIRAN TUBUH MANUSIA

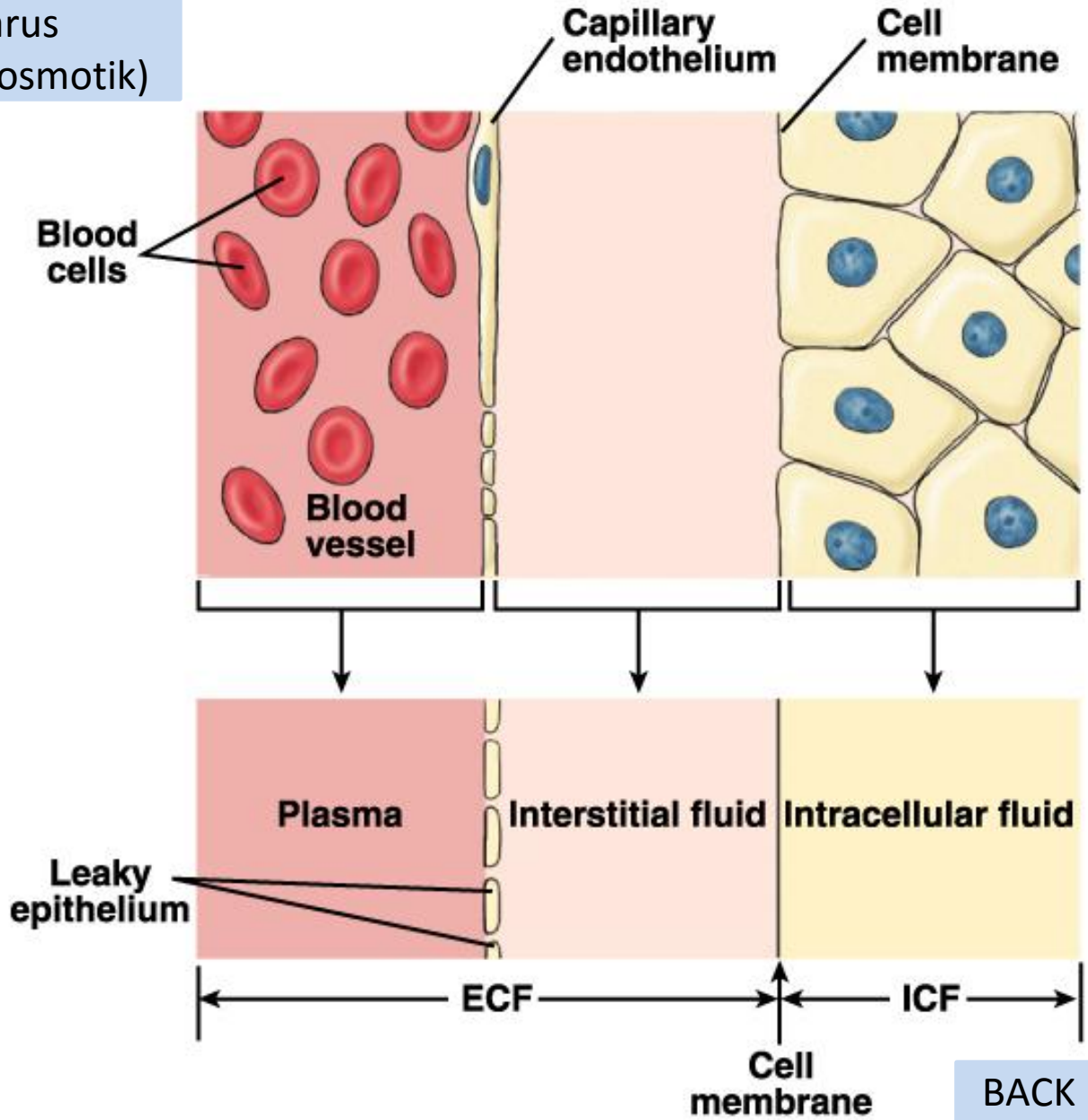
Untuk mempertahankan kondisi cairan tubuh (plasma, intra/eksta sel), air yang masuk harus seimbang dengan air yang keluar



KONDISI CAIRAN TUBUH MANUSIA

3 ruang dalam tubuh yang harus dijaga keseimbangan cairan (osmotik)

- Sitoplasma
- Cairan antar sel
- Plasma darah



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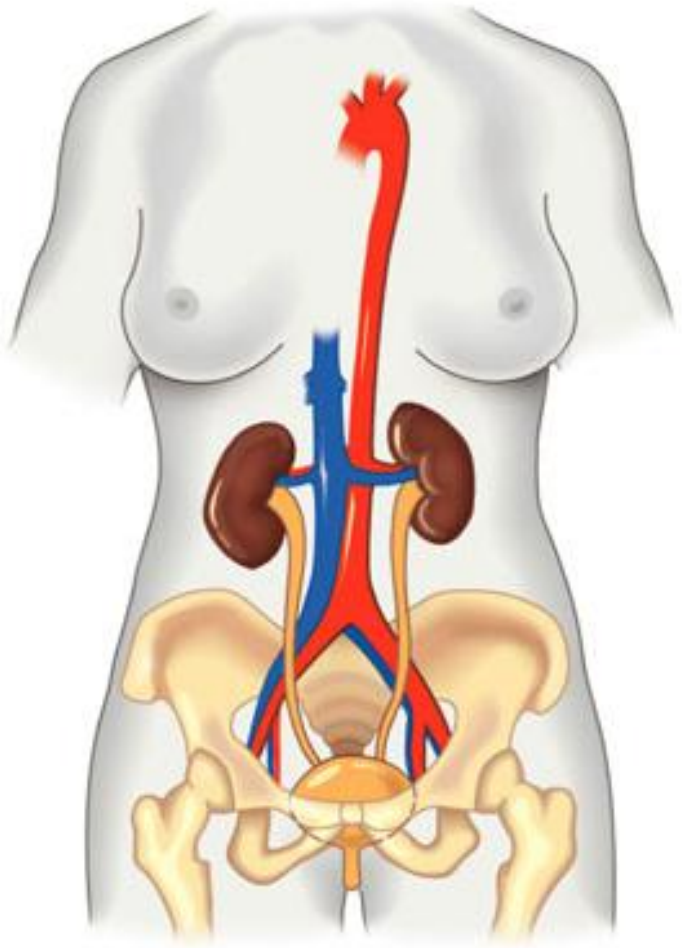


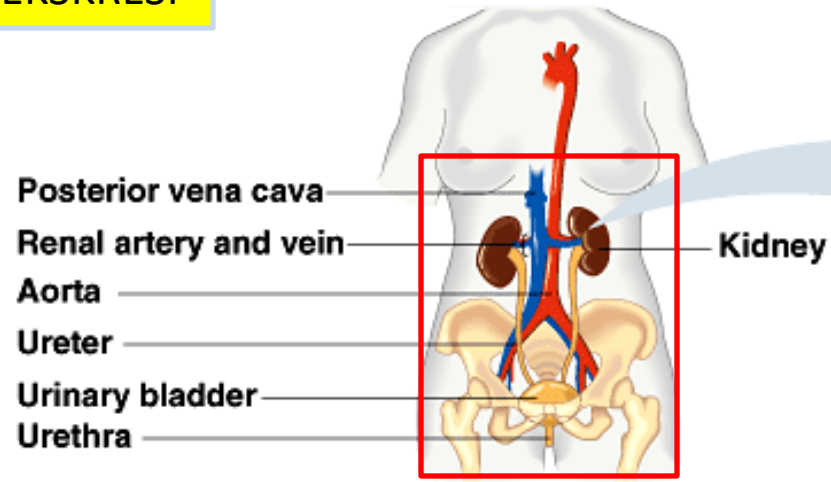
GINJAL

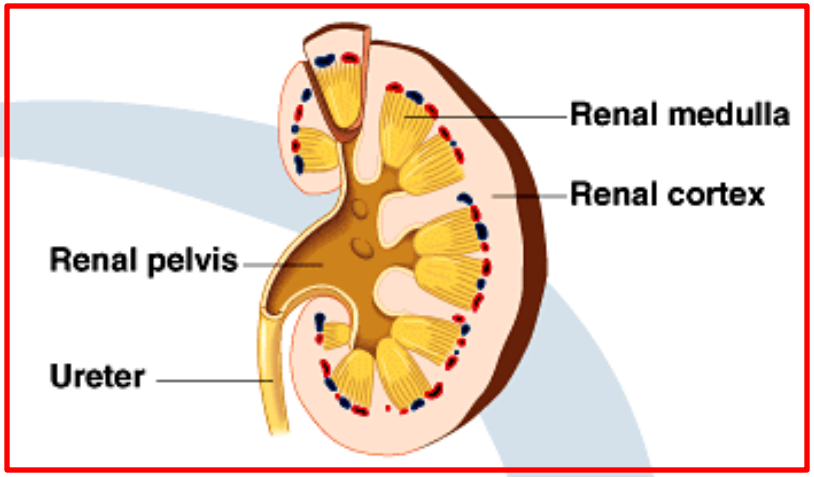
- ANATOMI
- FISIOLOGI
- GANGGUAN

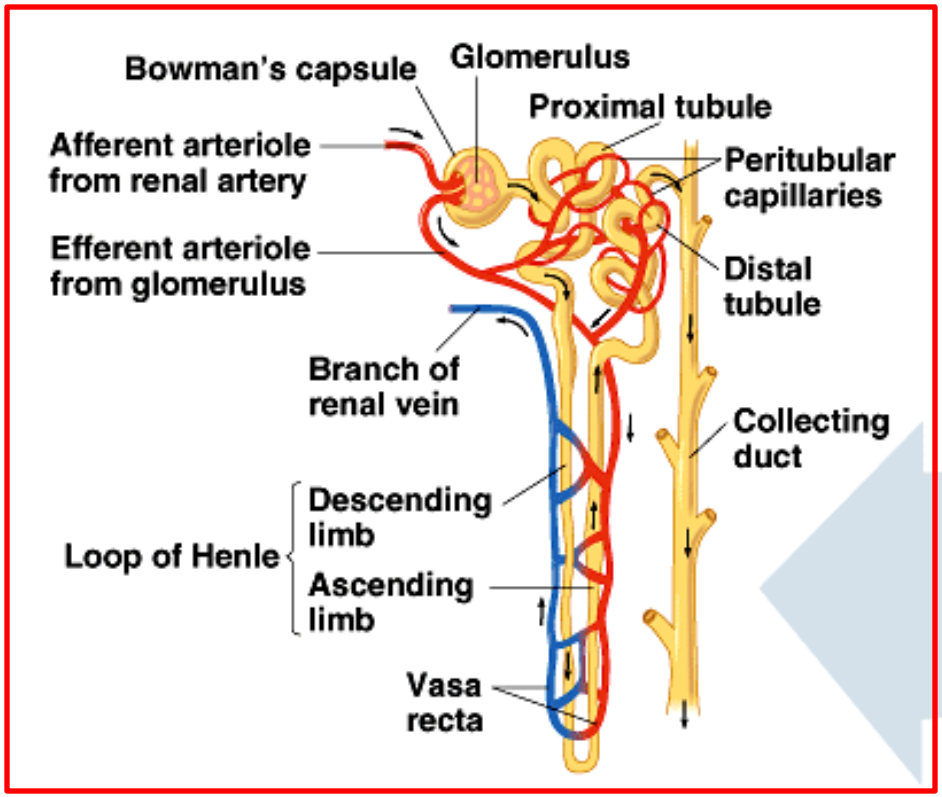
BACK

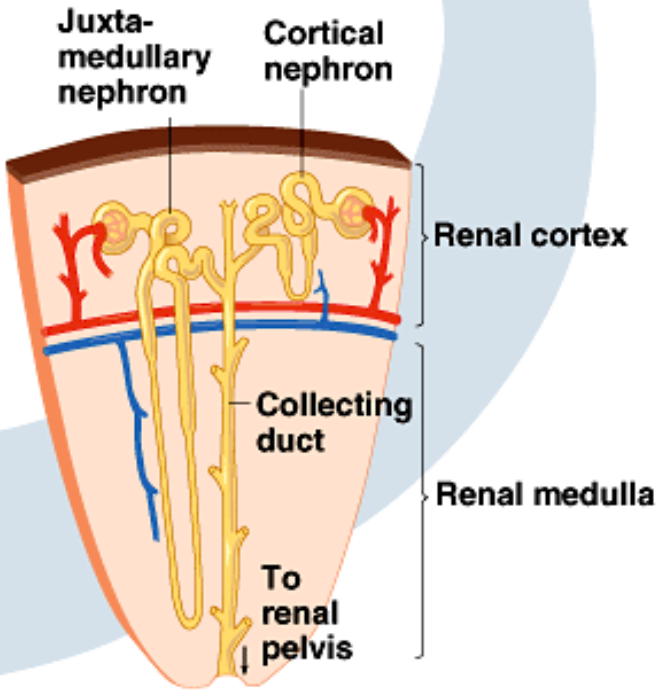
SISTEM EKSKRESI

ANATOMI GINJAL





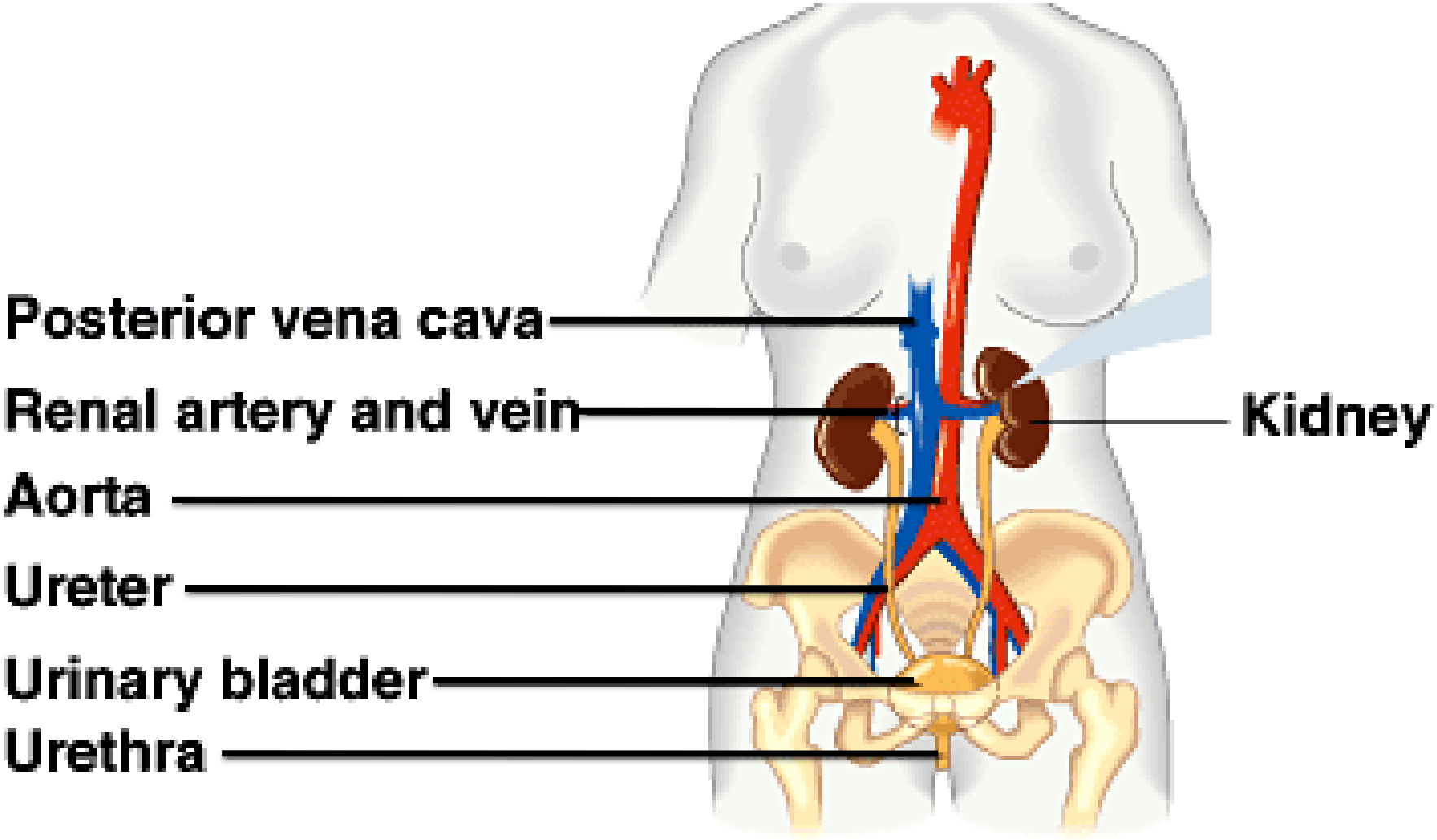




BACK

SISTEM EKSKRESI

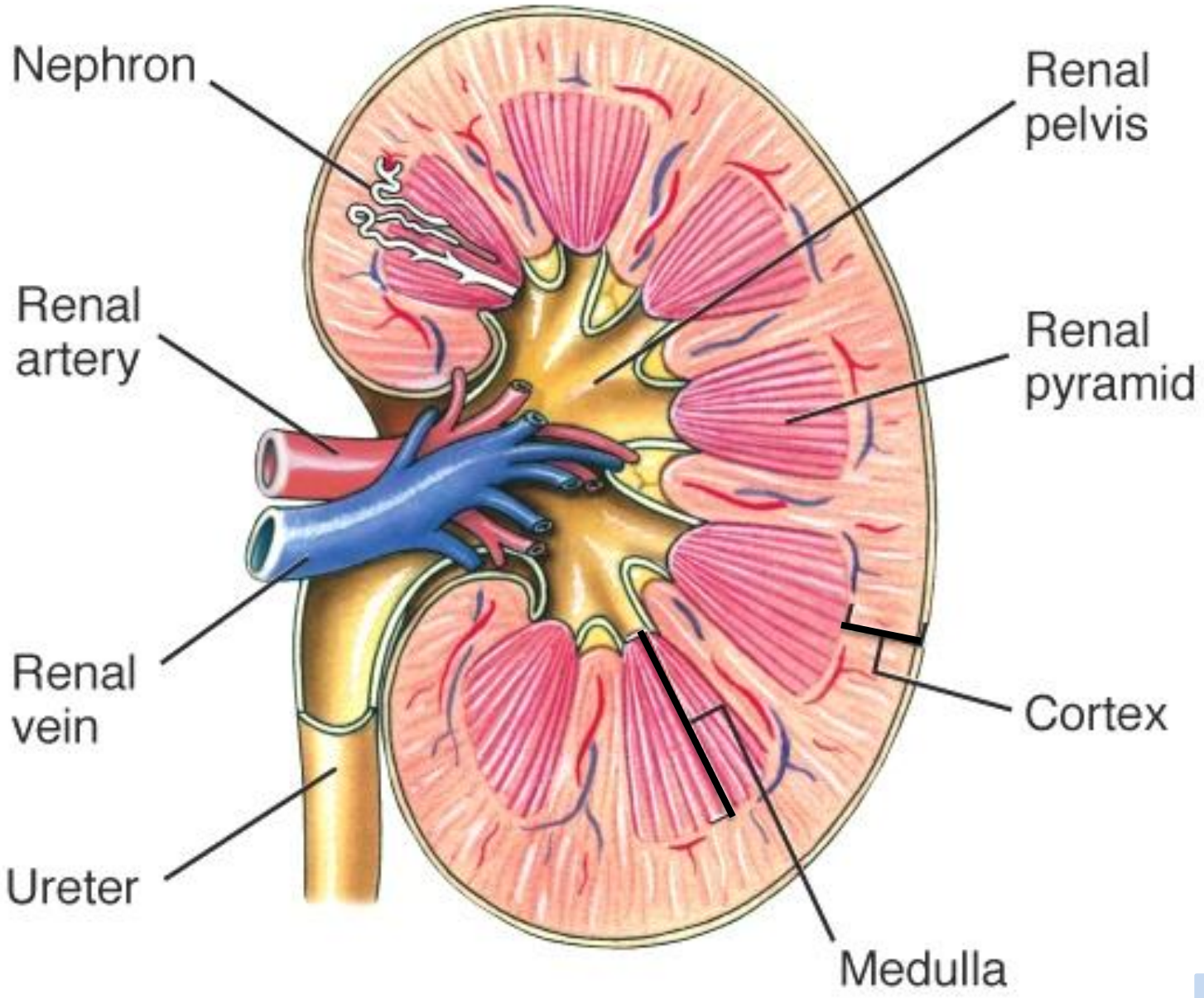
ANATOMI GINJAL



BACK

SISTEM EKSKRESI

ANATOMI GINJAL



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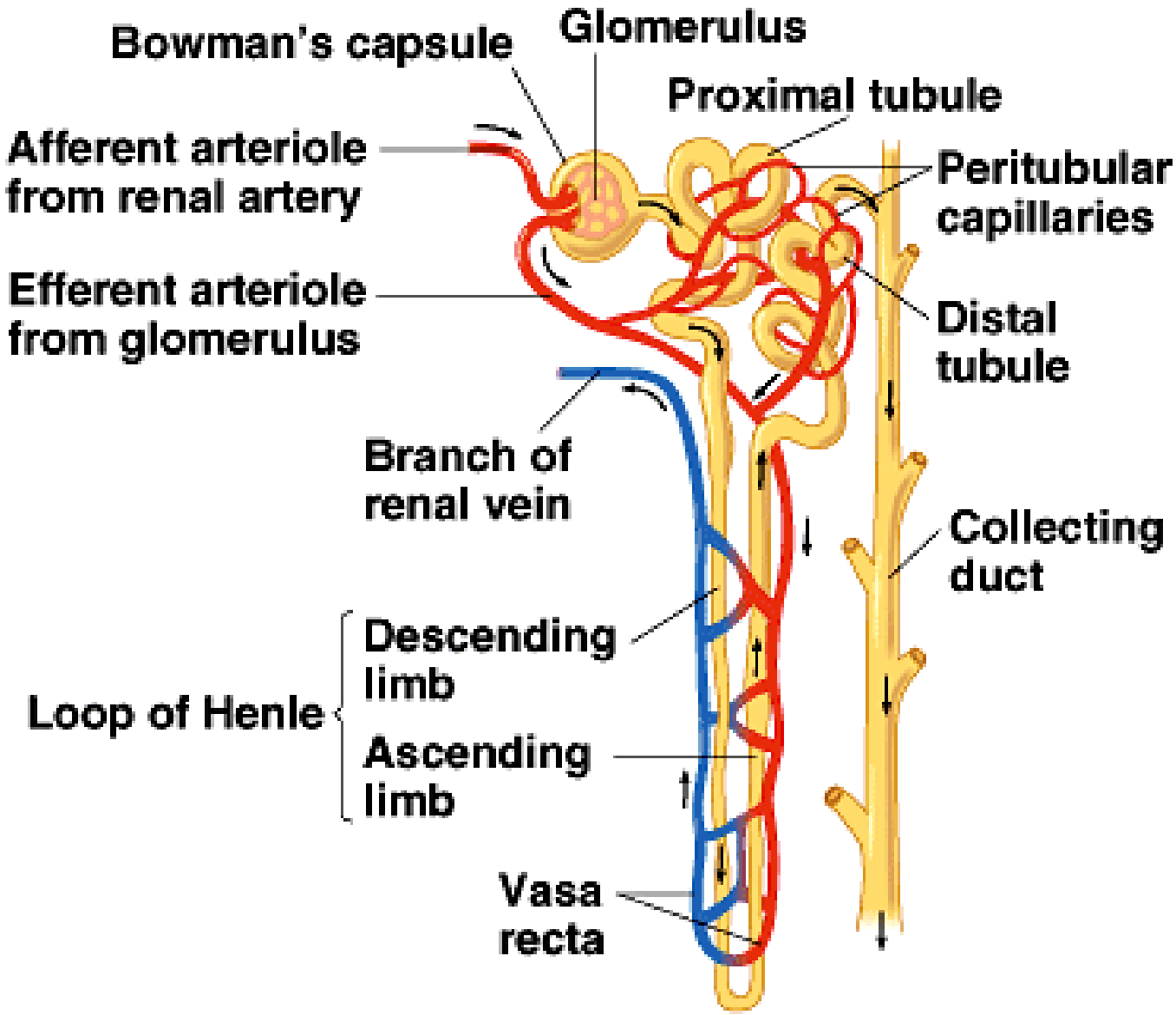
ANATOMI GINJAL



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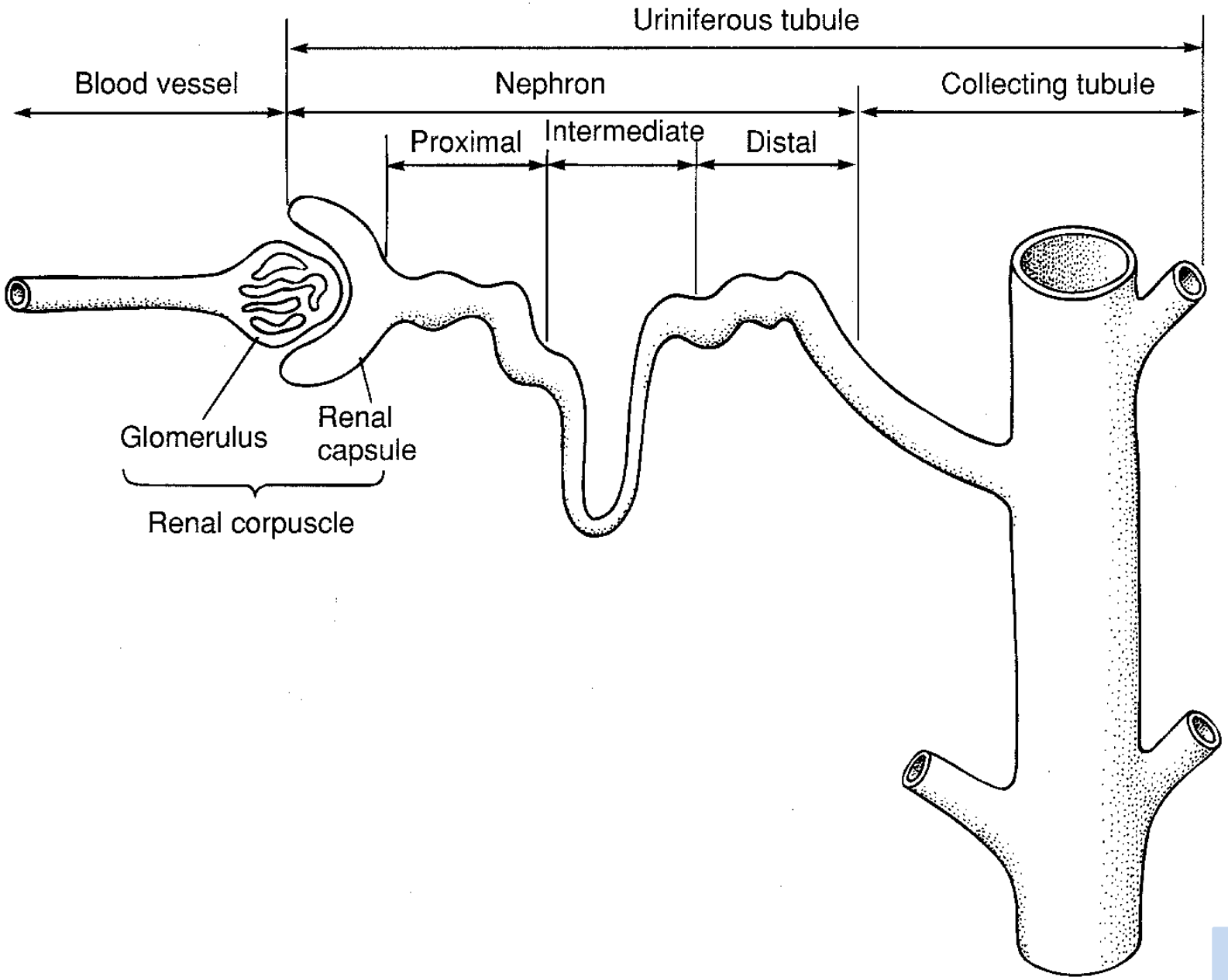
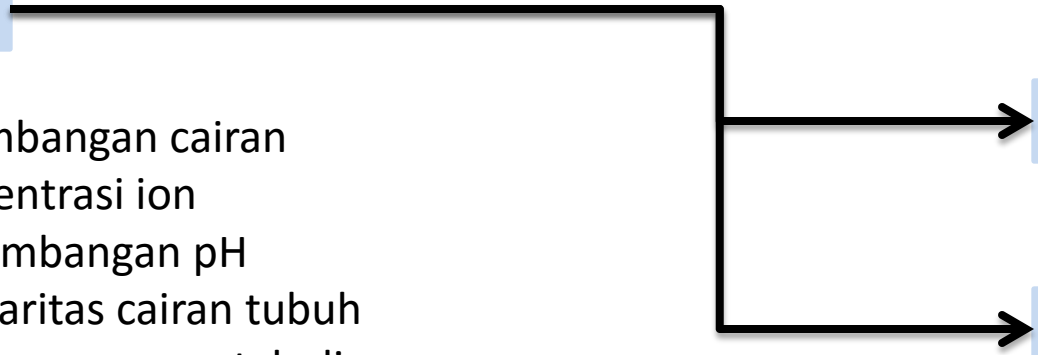
ANATOMI GINJAL

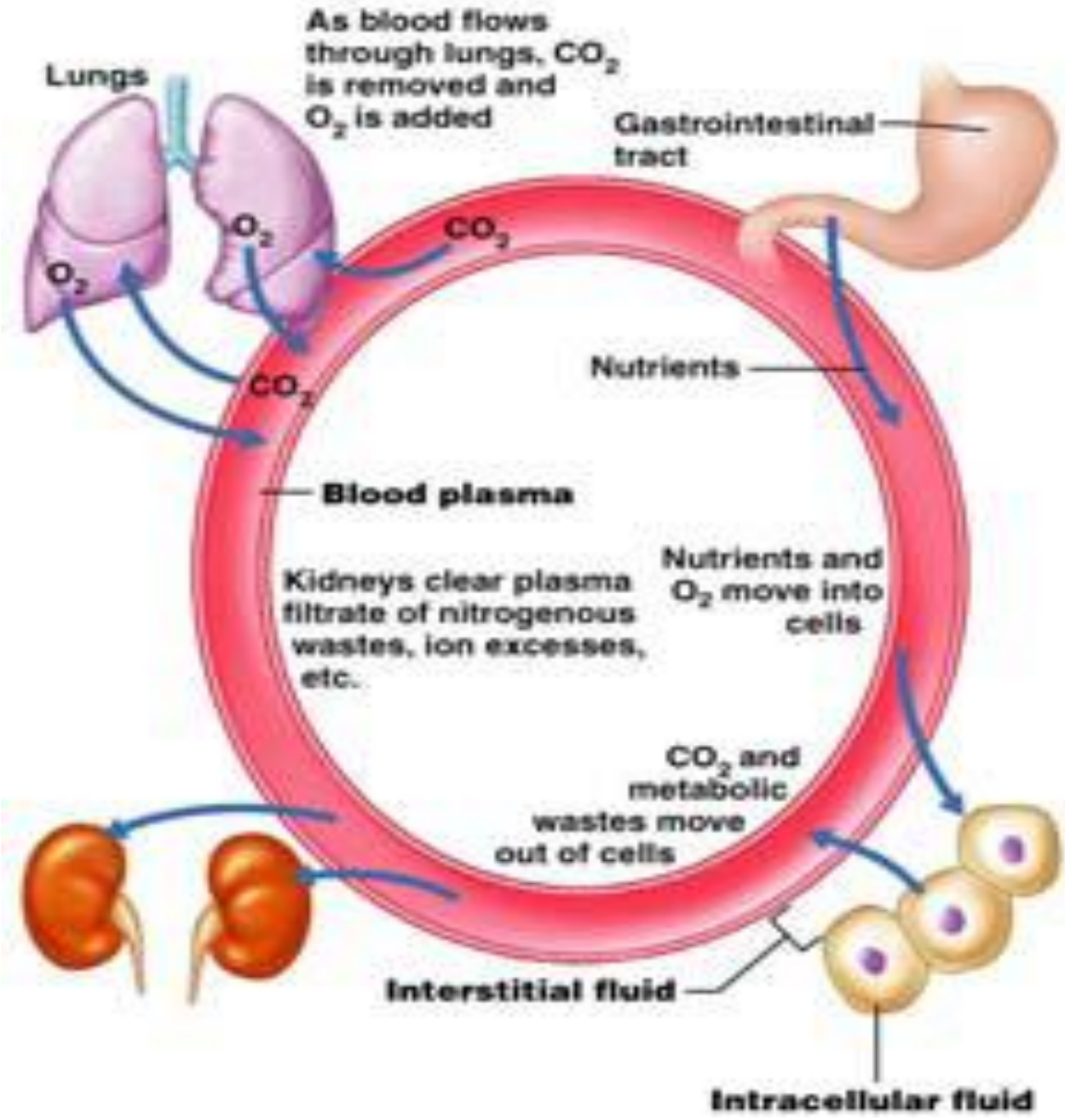


BACK

Fungsi ginjal

- Menjaga keseimbangan cairan
- Mengatur konsentrasi ion
- Mengatur keseimbangan pH
- Menjaga osmolaritas cairan tubuh
- Mengeluarkan buangan metabolisme
- Mengeluarkan benda asing
- Menjaga tekanan arteri
- Mensekresikan eritropoietin dan renin
- Mengaktifkan vitamin D



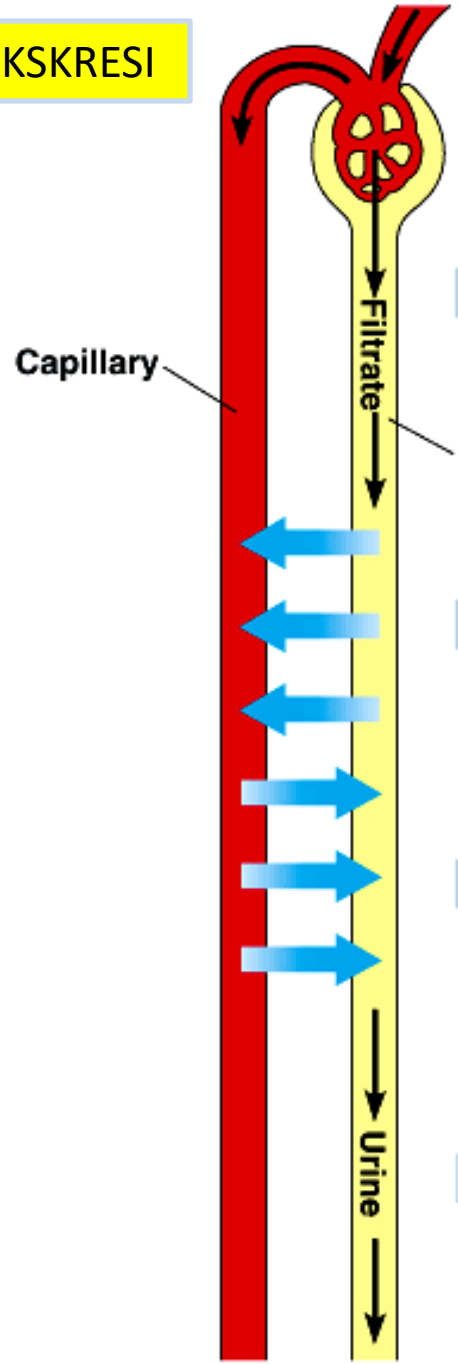

As blood flows through lungs, CO_2 is removed and O_2 is added
Lungs
Gastrointestinal tract
O_2
O_2
CO_2
CO_2
Nutrients
Blood plasma
Kidneys clear plasma filtrate of nitrogenous wastes, ion excesses, etc.
Nutrients and O_2 move into cells
CO_2 and metabolic wastes move out of cells
Interstitial fluid
Intracellular fluid

BACK

SISTEM EKSKRESI

FISIOLOGI GINJAL

Mekanisme



Filtration

- Masuknya carian plasma dan zat terlarut dari arteri (glomerulus) ke dalam nefron (kapsul bowman)
- Materi filtrat = plasma darah

Reabsorption

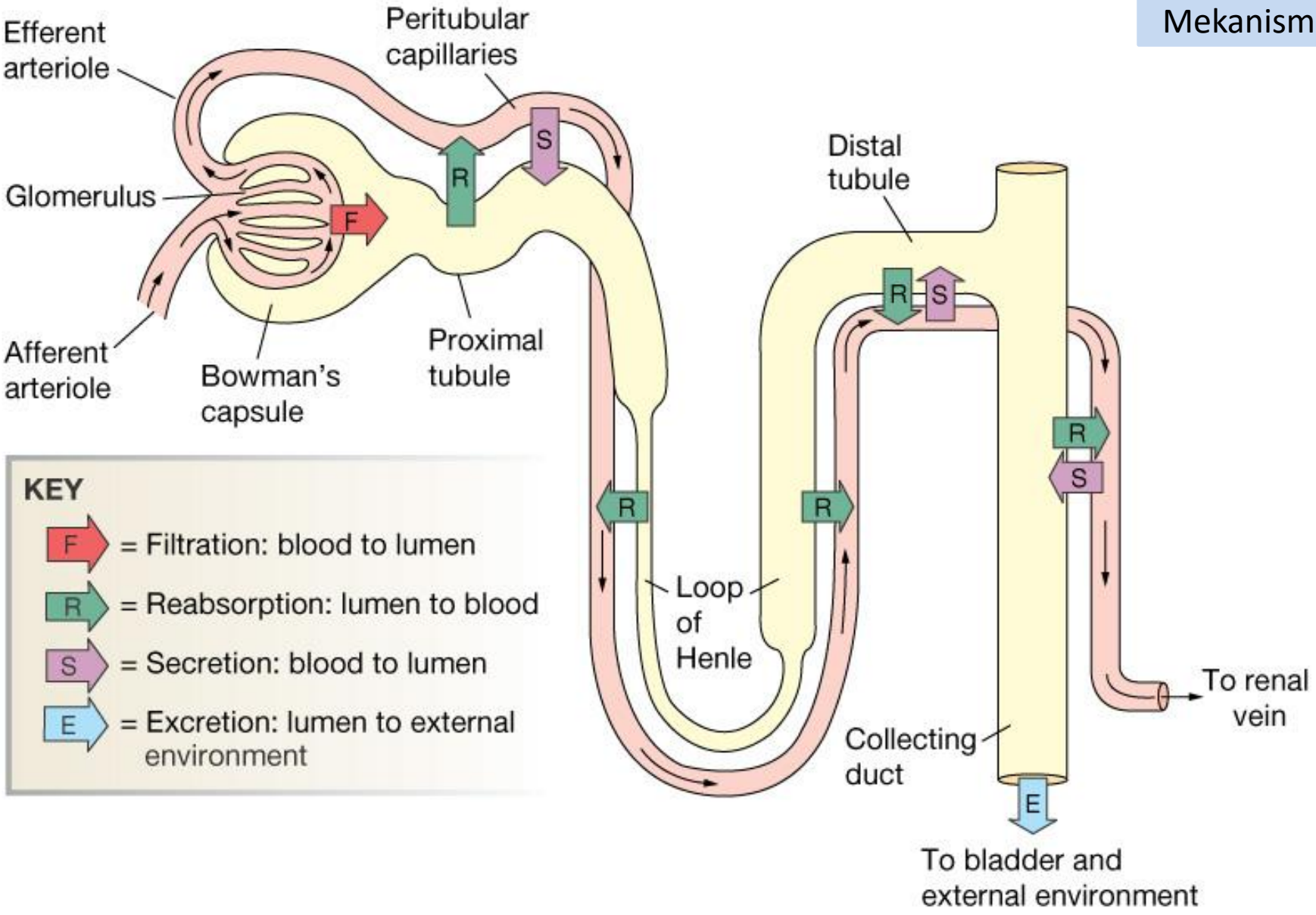
- Penyerapan kembali zat terlarut dan air dari nefron masuk ke pembuluh darah
- Perpindahan secara aktif dan pasif

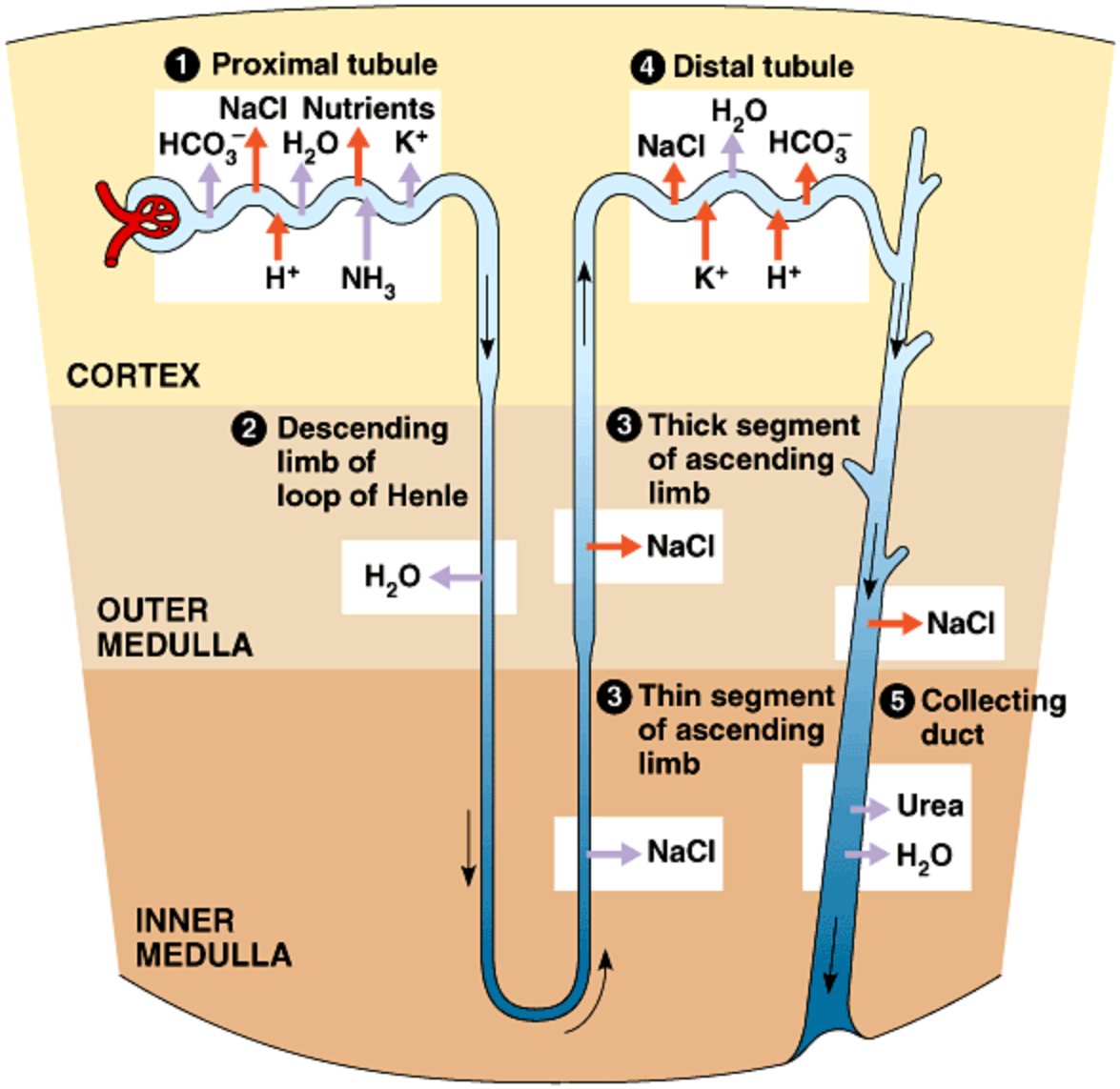
Secretion

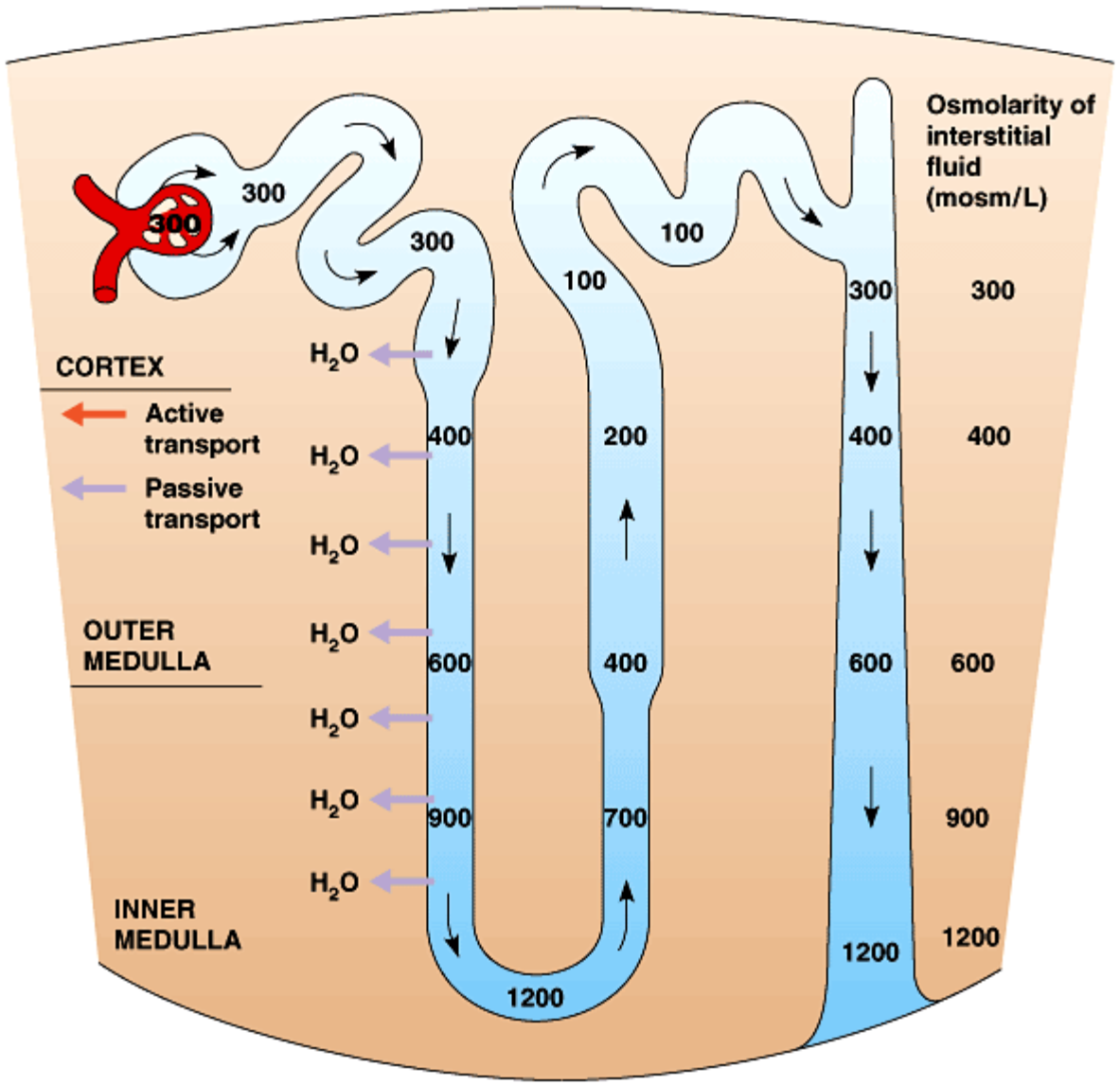
- Masuknya zat terlarut dan air dari pembuluh darah ke nefron (tanpa melalui glomerulus)
- Perpindahan secara aktif dan pasif

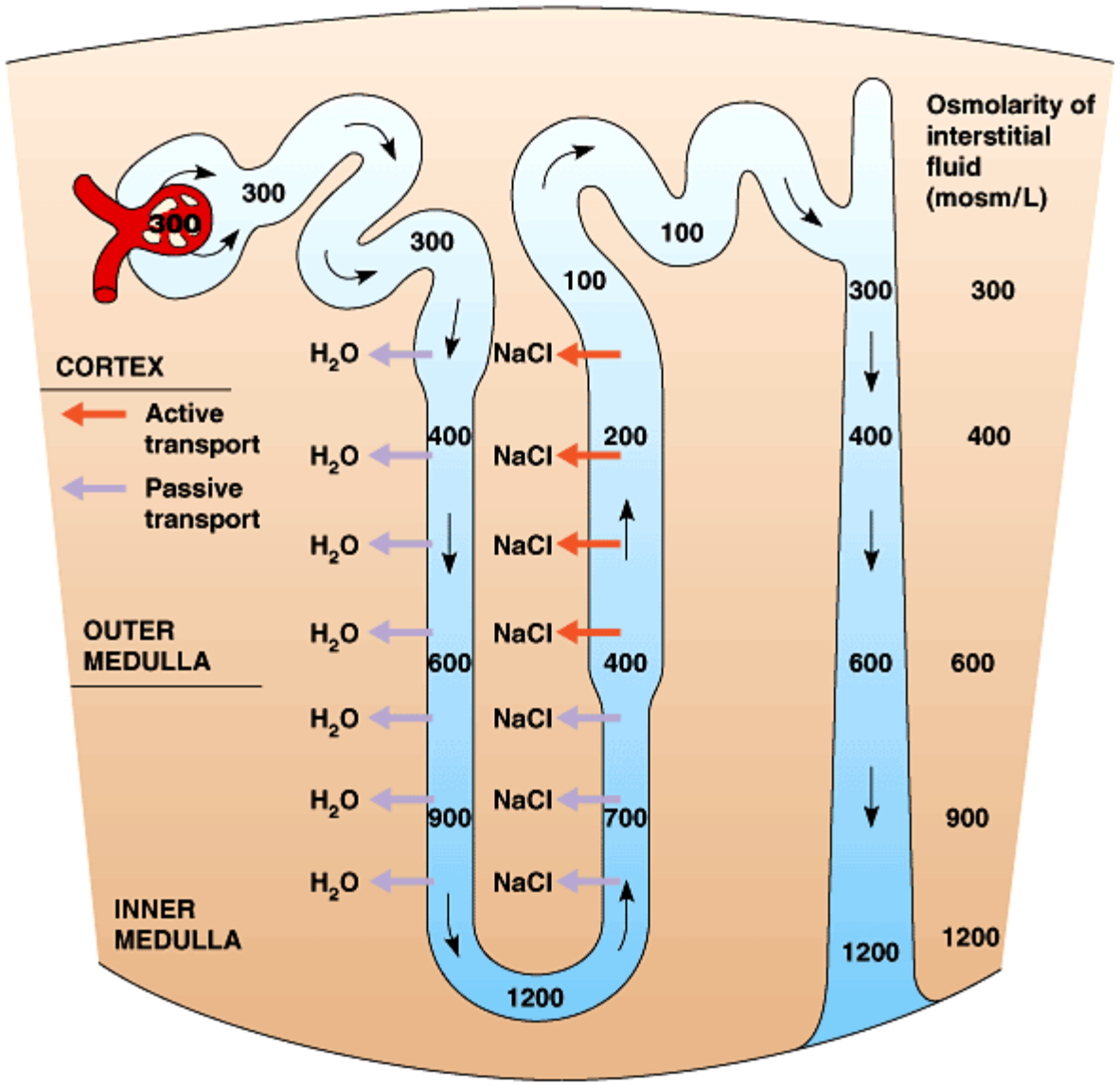
Excretion

- Pengeluaran urin hasil proses filtrasi, reabsorpsi, dan sekresi ureter menuju vesica urinaria


Efferent arteriole
Peritubular capillaries
Glomerulus
Afferent arteriole
Bowman's capsule
Proximal tubule
Distal tubule
Loop of Henle
Collecting duct
To renal vein
To bladder and external environment
F
R
S
E
KEY
F = Filtration: blood to lumen
R = Reabsorption: lumen to blood
S = Secretion: blood to lumen
E = Excretion: lumen to external environment







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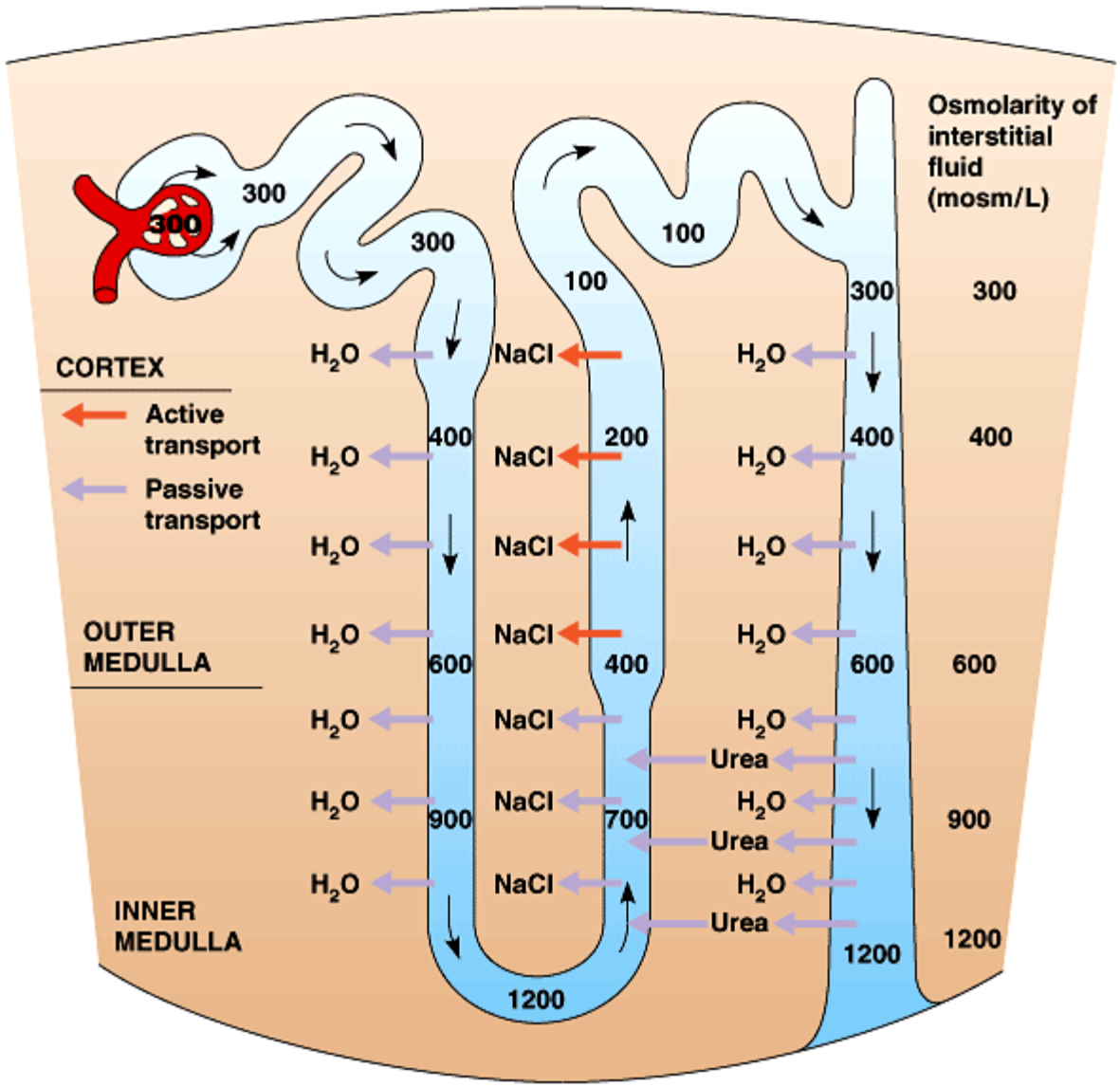
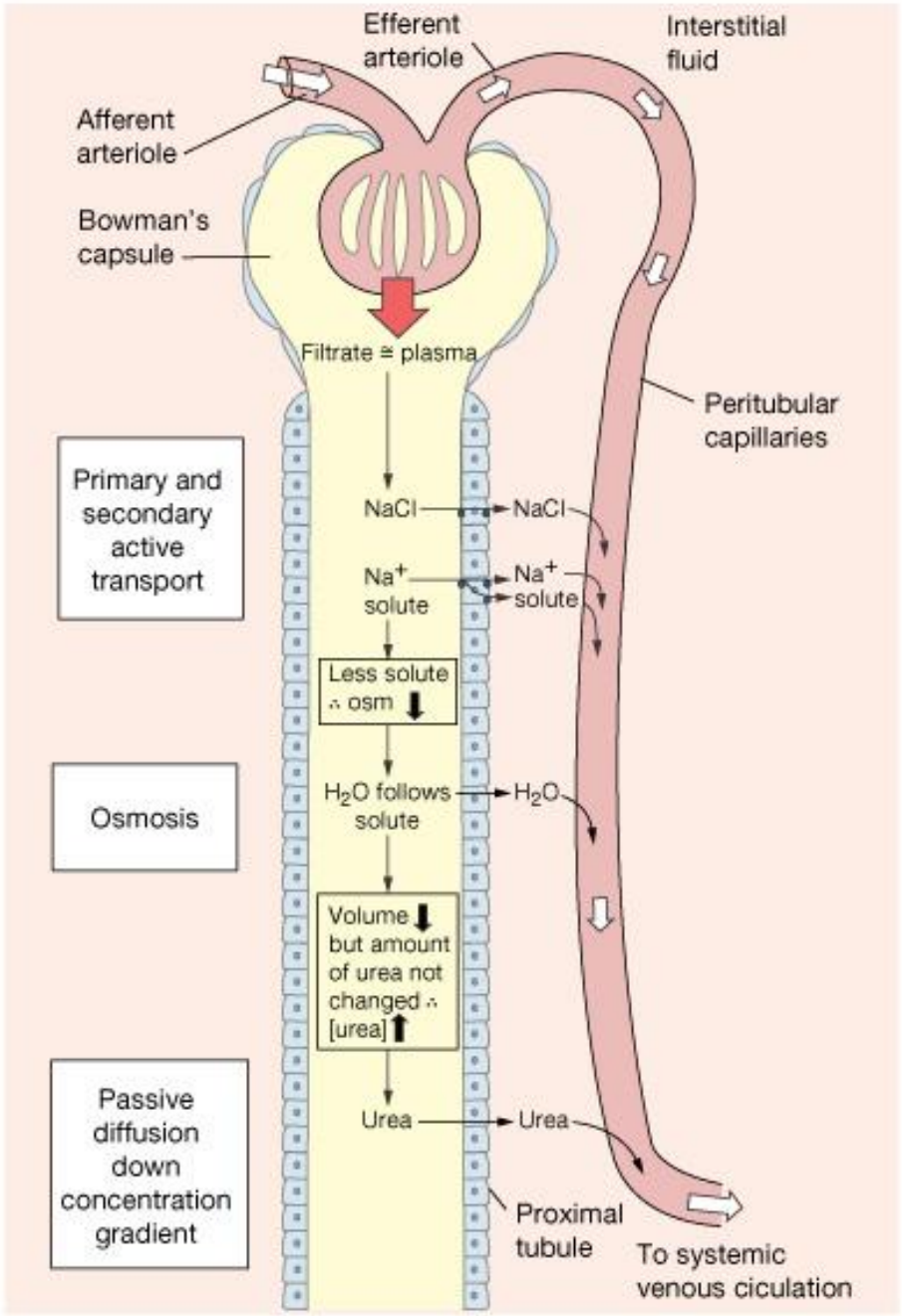
FISIOLOGI GINJAL

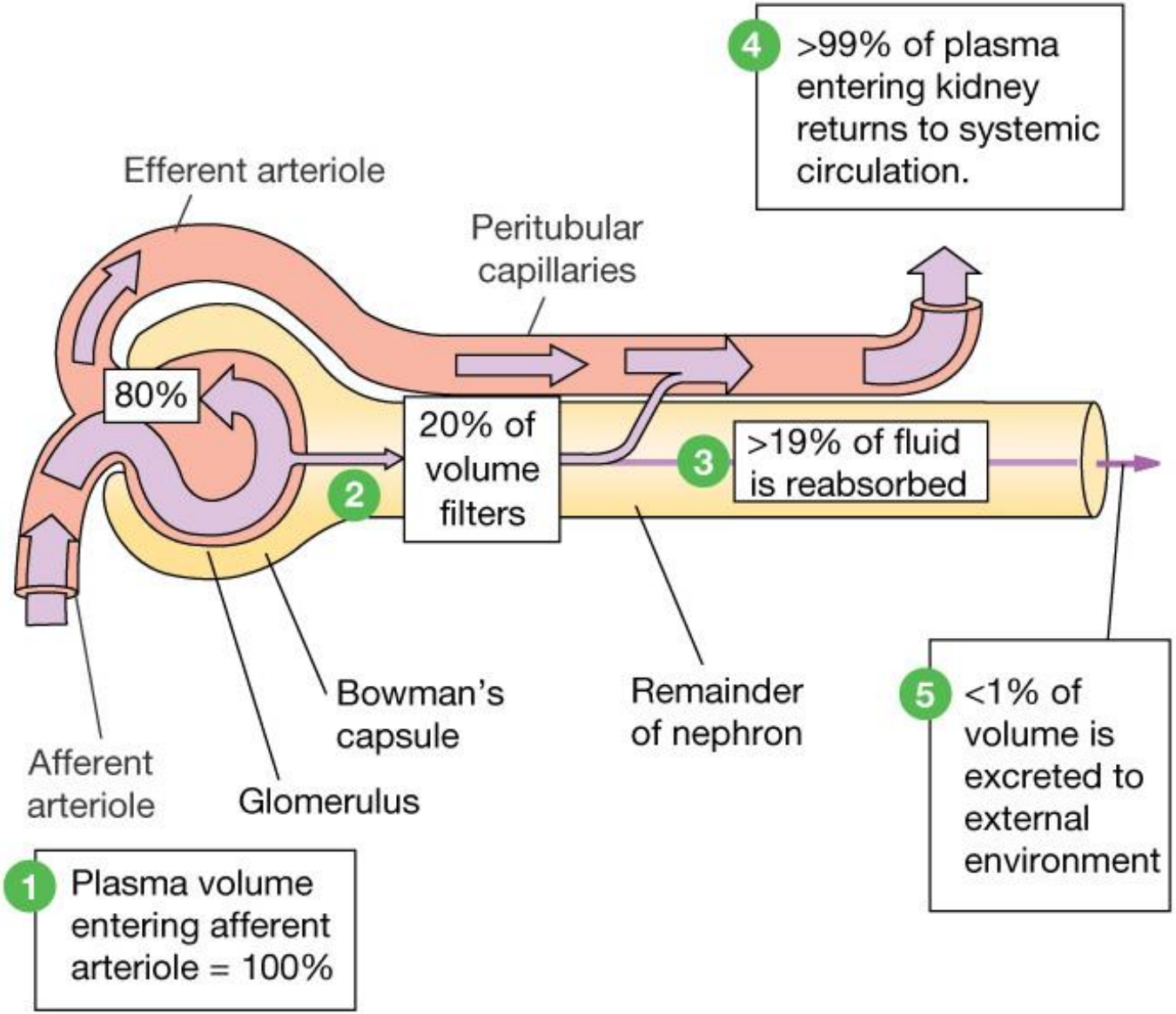
Mekanisme



Prinsif perpindahan zat terlarut dan air antara nefron dan pembuluh darah

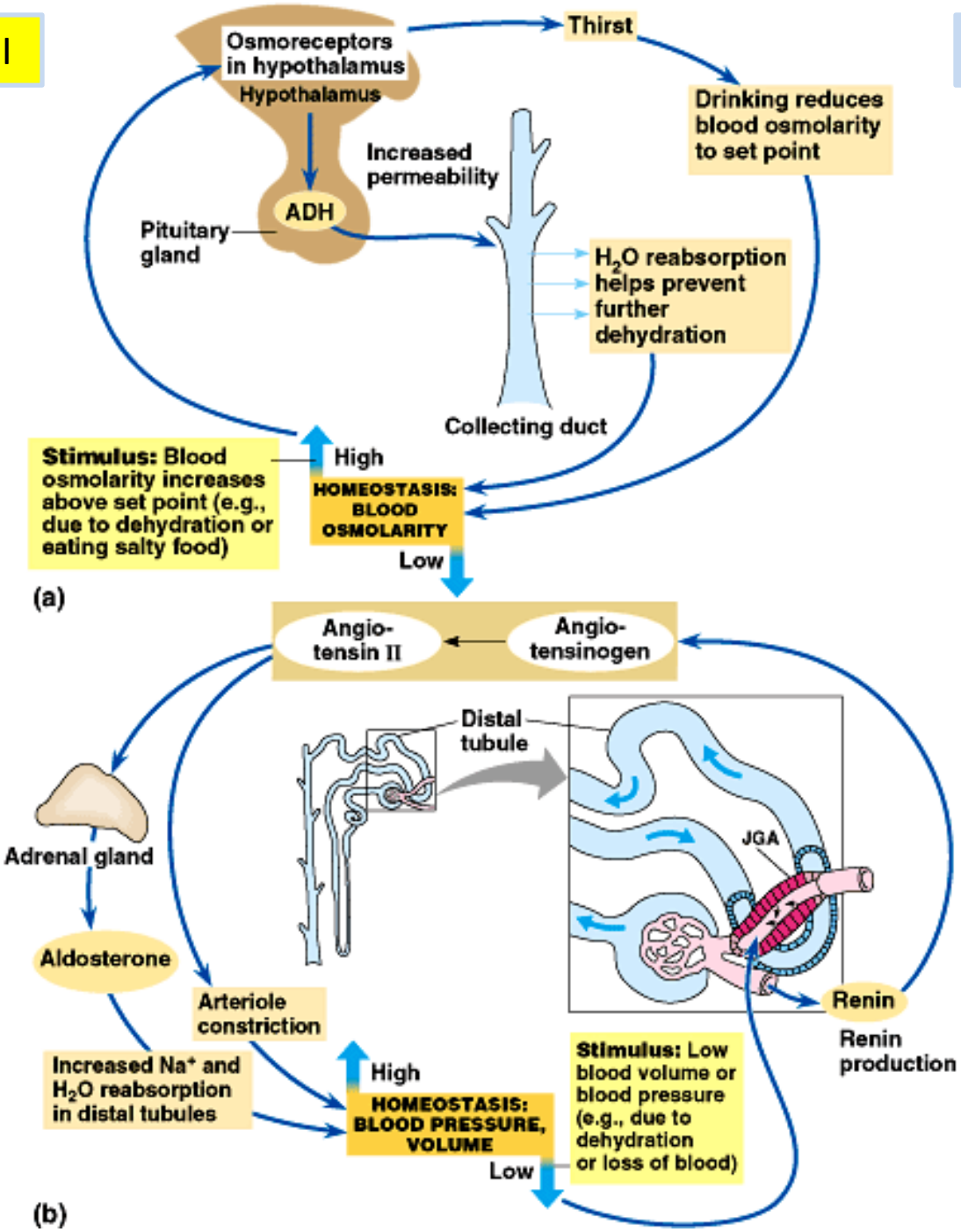


Perbandingan volume pembuluh darah dan buangan pada nefron



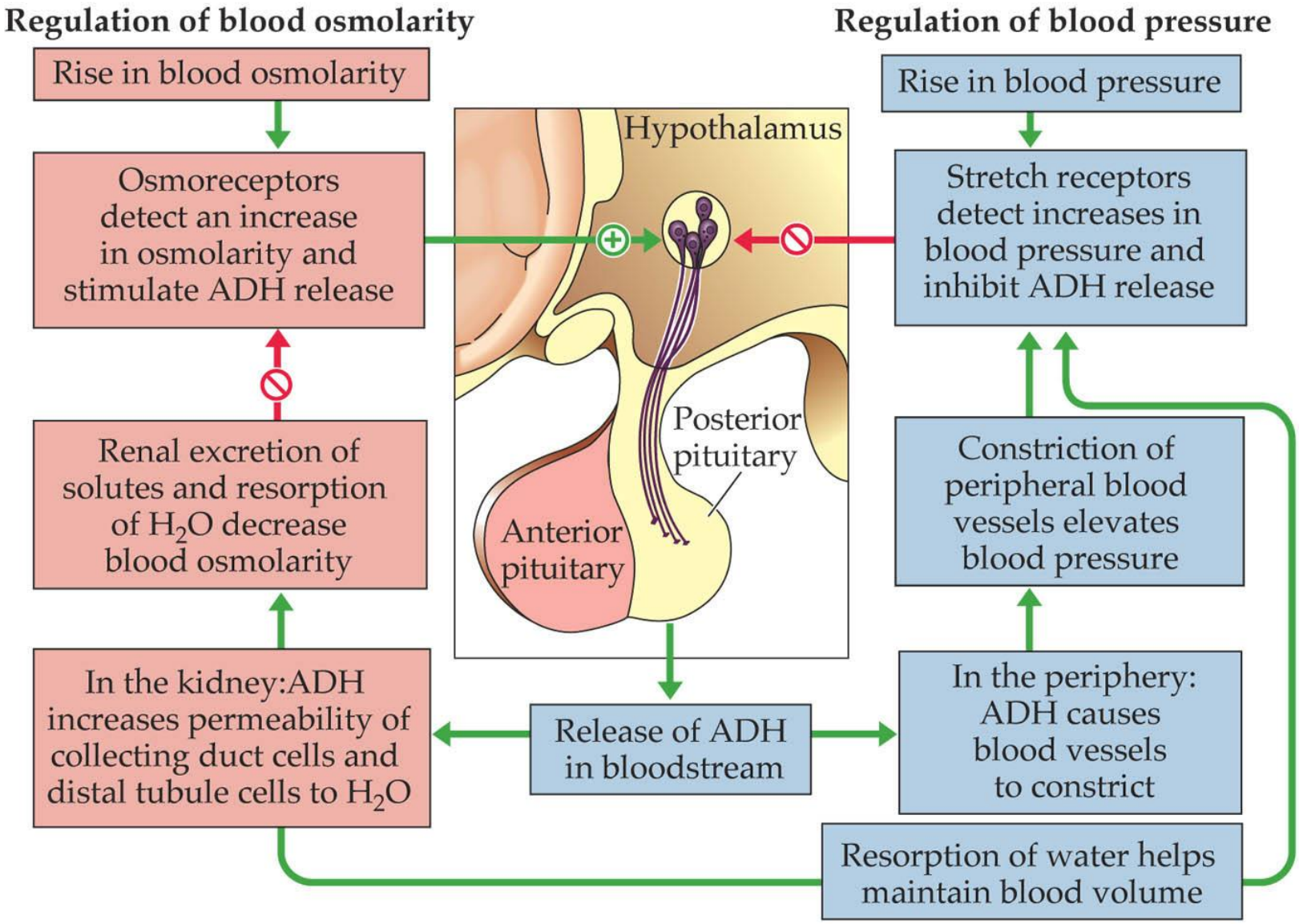
SISTEM EKSKRESI

SISTEM KONTROL



SISTEM EKSKRESI

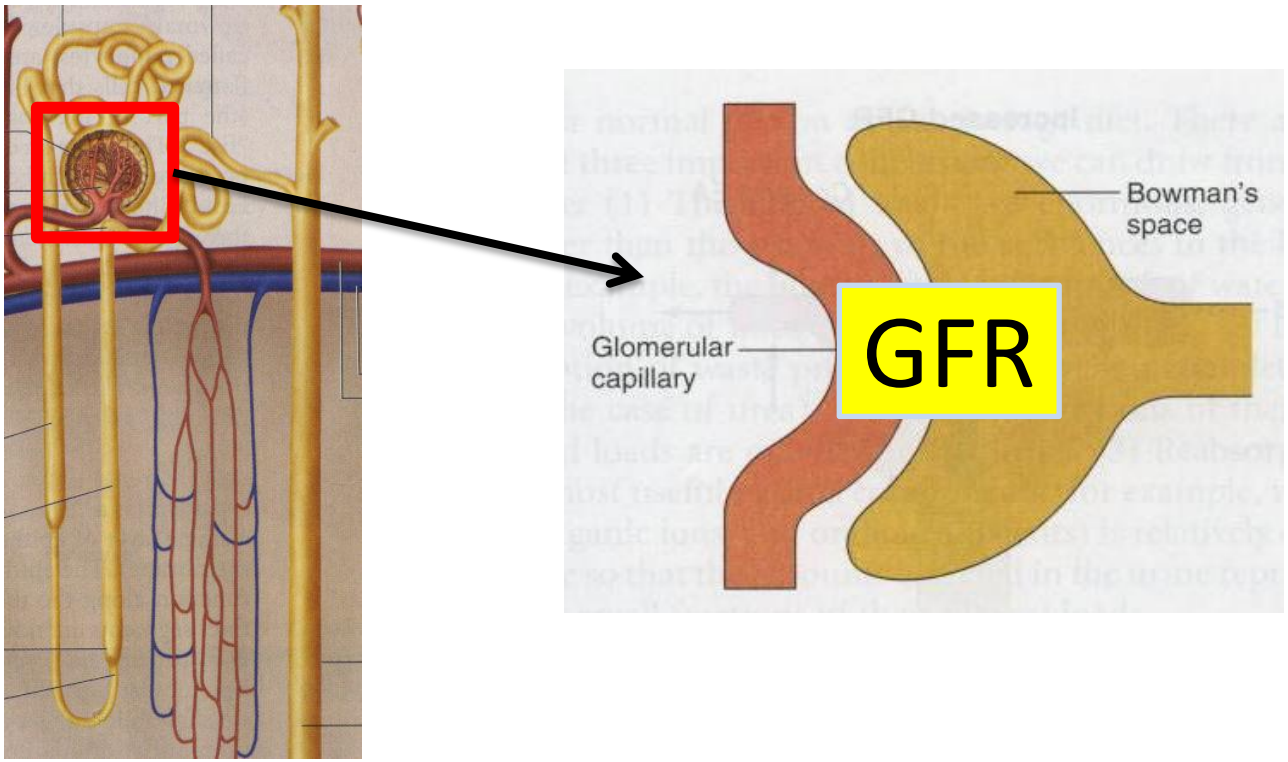
SISTEM KONTROL



BACK

Glomerular Filtration Rate (GFR)

- Volume cairan filtrasi yang melewati glomerulus dan kapsul bowman per satuan waktu
- Dapat digunakan untuk mengetahui adanya kerusakan pada ginjal



GFR normal

- Laki-laki : 97-137 ml/menit
- Perempuan : 88-128 ml/menit

Pengukuran GFR dapat dilakukan dengan

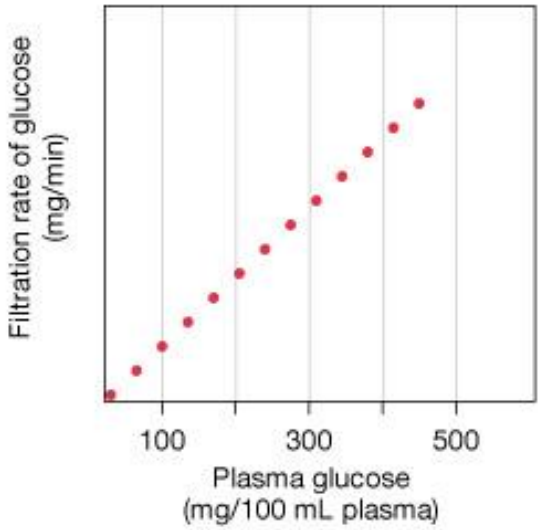
- Volume INULIN yang dikeluarkan melalui urin
  atau
- Volume KREATININ yang dikeluarkan melalui urin

Kedua zat ini dapat bebas mengalami filtrasi dan tidak direabsorpsi dan disekresi

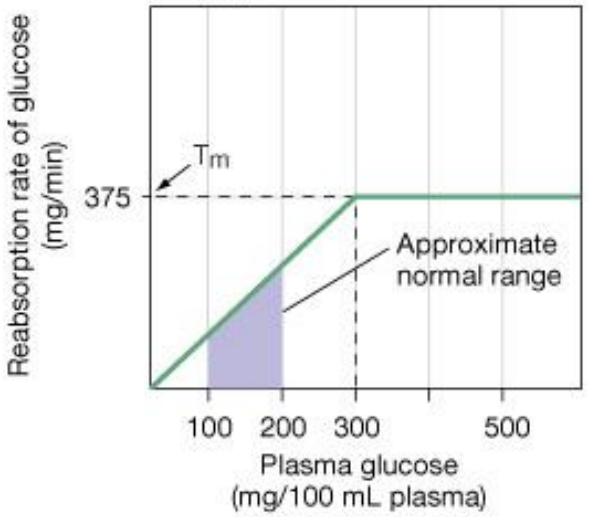
$$GFR = \frac{U_i \cdot V}{P_i}$$

U_{ik} = Konsentrasi INULIN atau KREATININ dalam urin (mg/ml)
V = Volume urin perhari (ml/hari)
P_{ik} = Konsentrasi INULIN atau KREATININ dalam plasma (mg/ml)

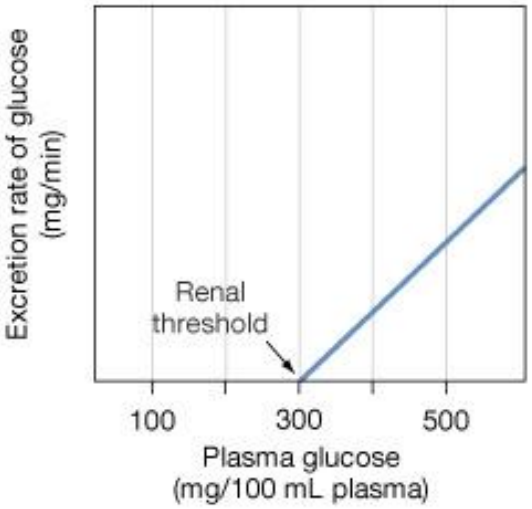
(a) Filtration of glucose is proportional to the plasma concentration.



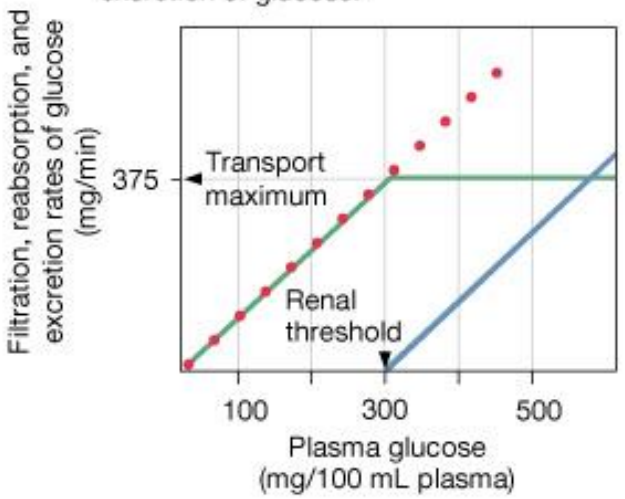
(b) Reabsorption of glucose is proportional to plasma concentration until the transport maximum (T_m) is reached.



(c) Glucose excretion is zero until the renal threshold is reached.



(d) Composite graph shows the relationship between filtration, reabsorption, and excretion of glucose.



BACK

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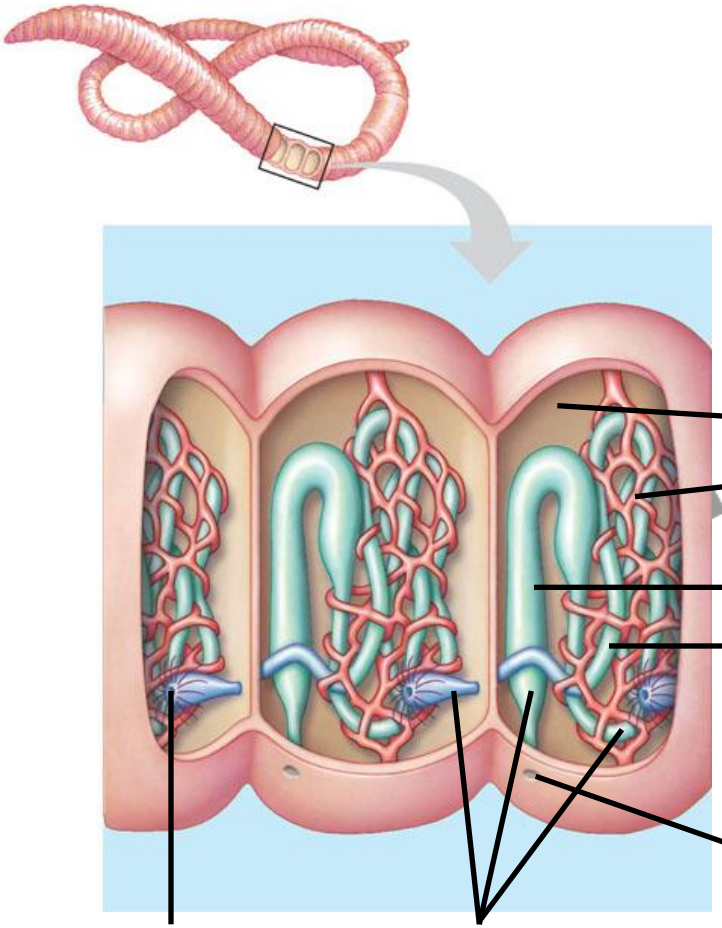
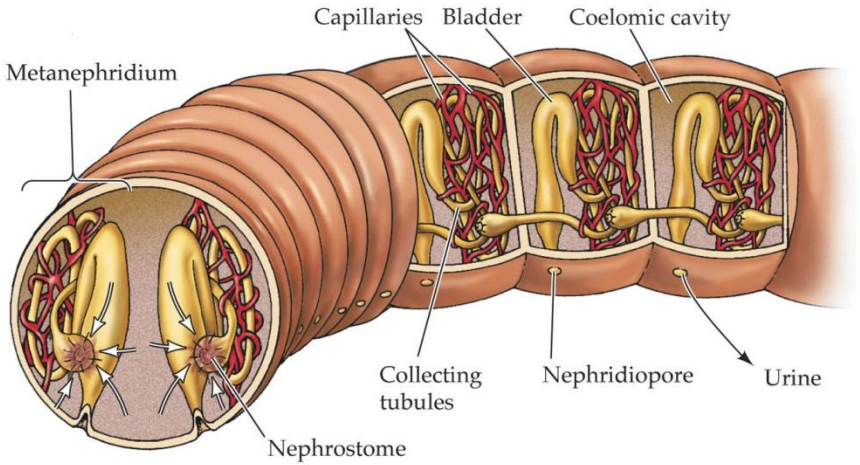
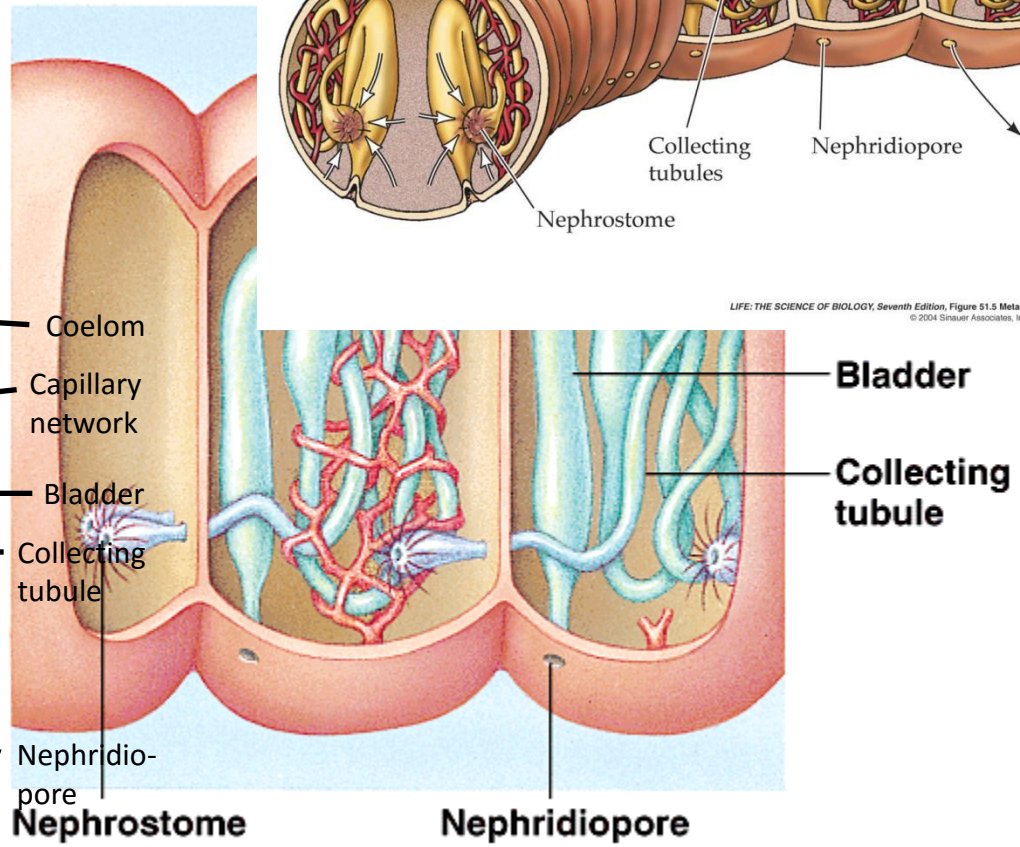




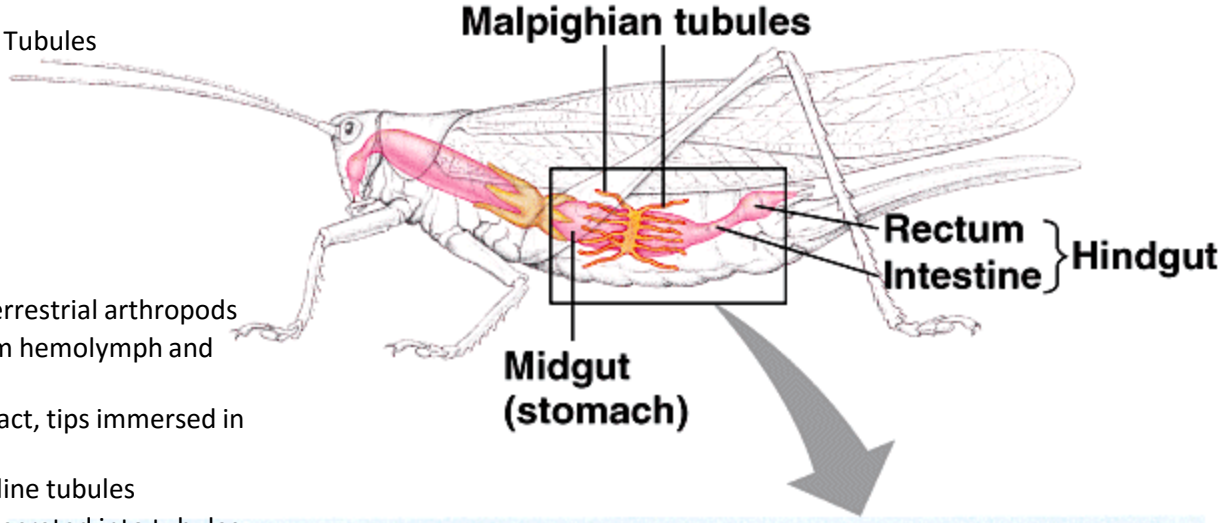


LIFE: THE SCIENCE OF BIOLOGY, Seventh Edition, Figure 51.5 Metanephridia in Earthworms
© 2004 Sinauer Associates, Inc. and W. H. Freeman & Co.

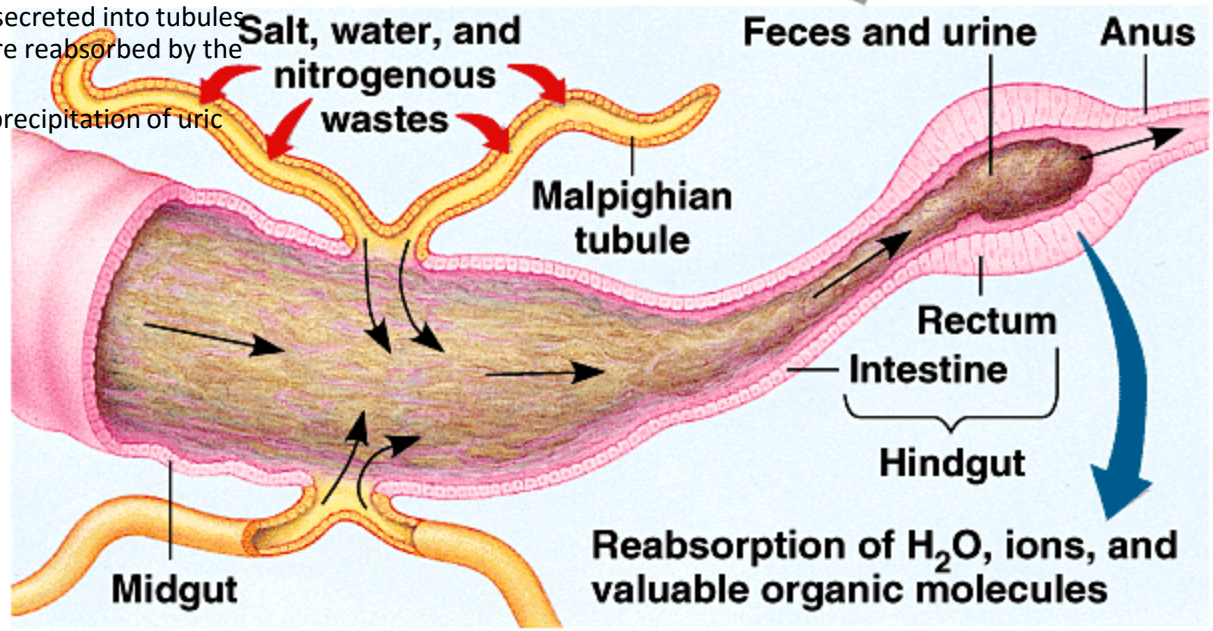
- Annelids
- each segment contains a pair of metanephridia
  - tubules bathed in coelomic fluid and encircled by capillaries
  - nephrostome collects fluid from coelom
  - transport epithelia in lumen of tubules resorb and secrete molecules
  - urine exits nephridiopore

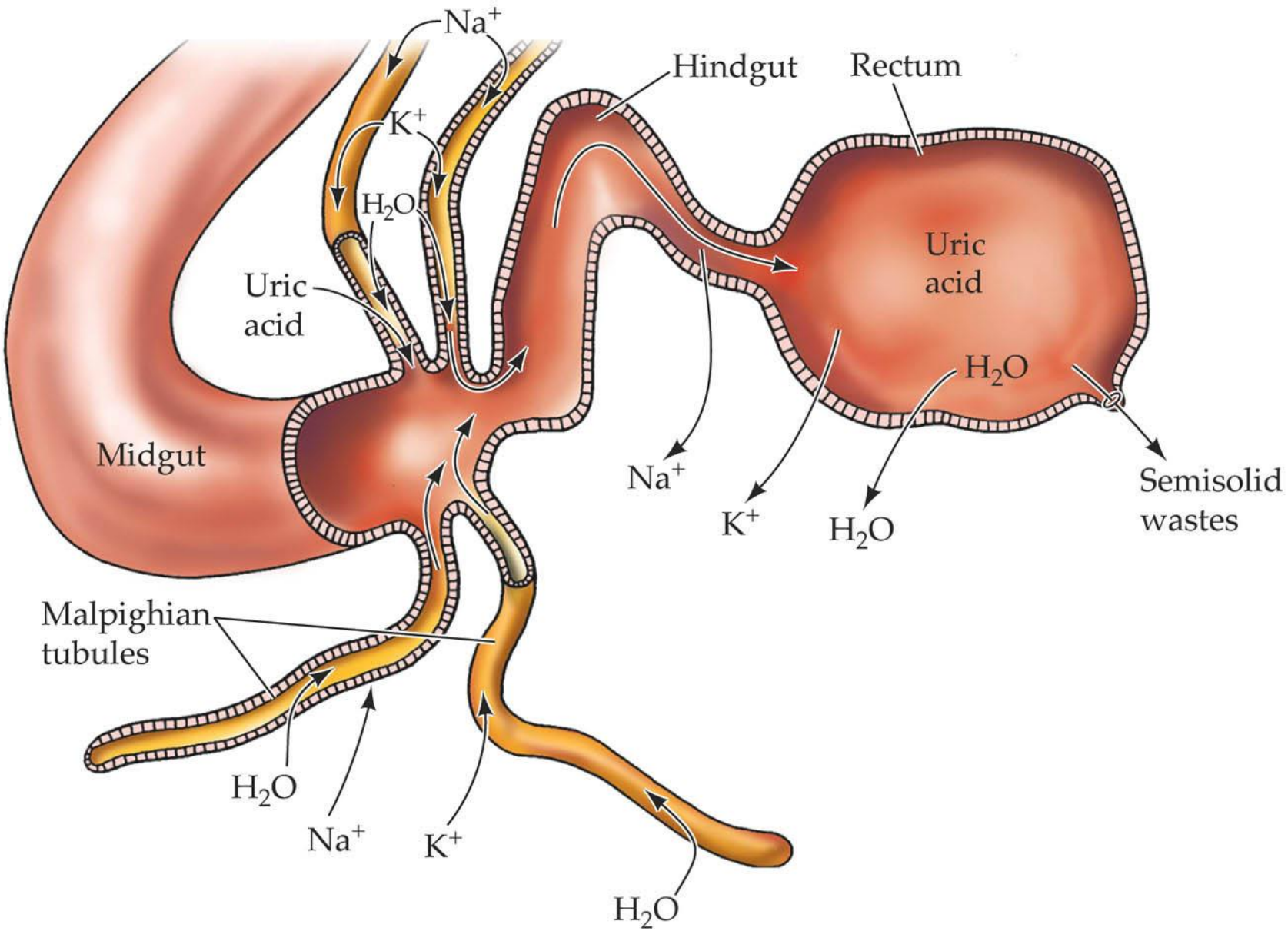
SISTEM EKSKRESI

Malpighian Tubules



- insects and other terrestrial arthropods
- remove wastes from hemolymph and osmoregulate
- open in digestive tract, tips immersed in hemolymph
- transport epithelia line tubules
  - solutes are secreted into tubules and some are reabsorbed by the rectum
  - causes the precipitation of uric acid

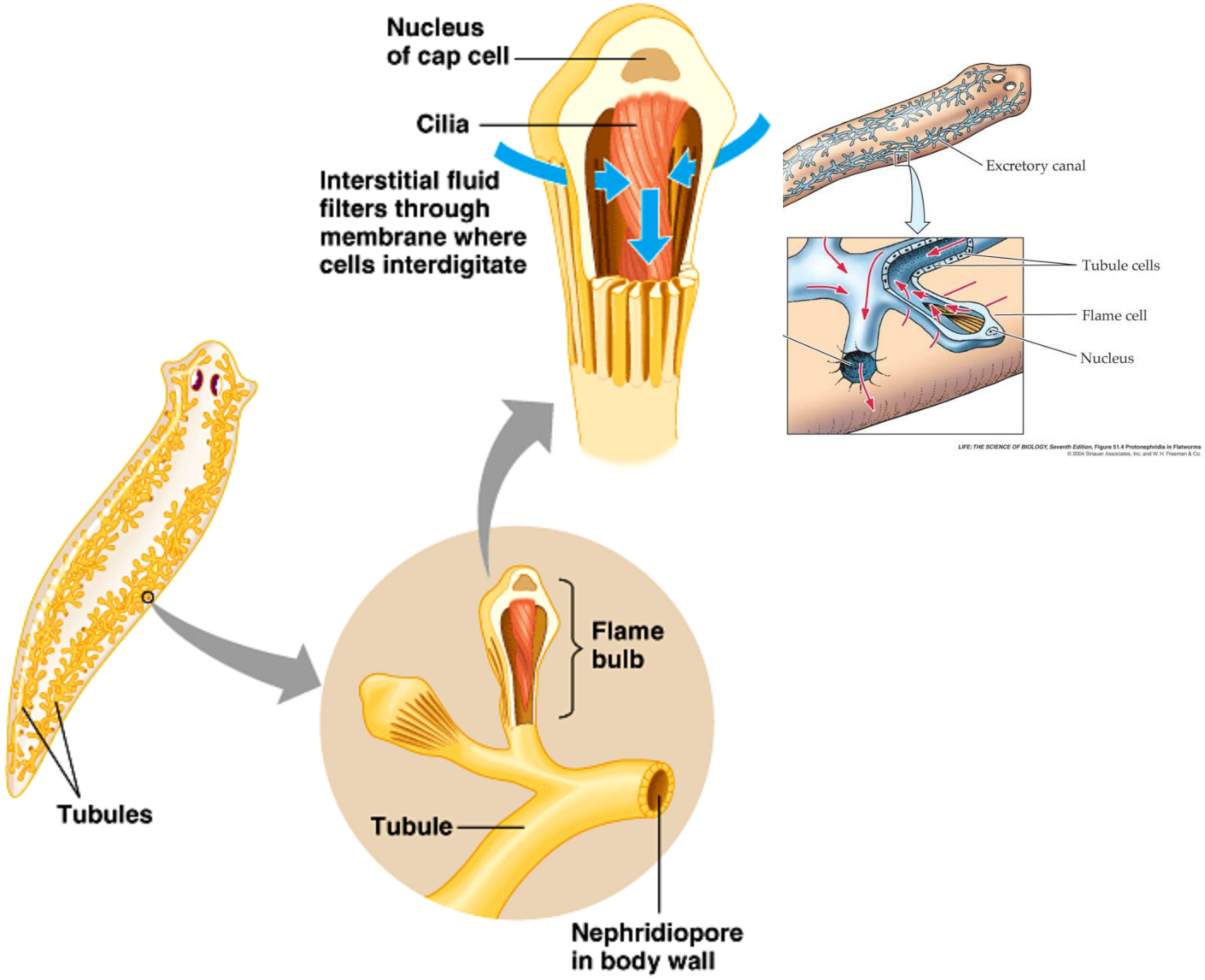




LIFE: THE SCIENCE OF BIOLOGY, Seventh Edition, **Figure 51.6 Malpighian Tubules in Insects (Part 2)**

Protonephridia

- freshwater flatworms
- network of blind-ended tub
- tubes branch through the b
    - tuft of cilia th
- urine empties via a nephrid



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