Q. Write the structure of glomerular membrane.

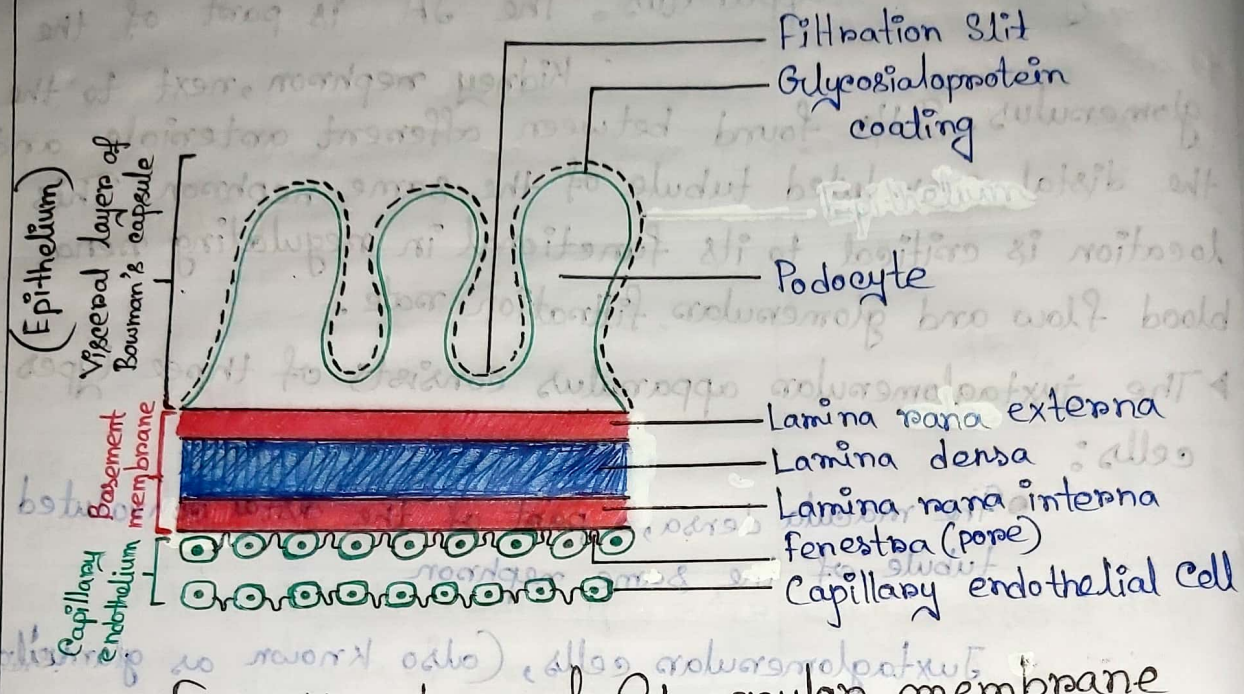


Fig: Structure of Glomerular membrane

Q. Glomerular Capillary membrane :

▶ Definition: The glomerular basement membrane (GBM) is the extracellular matrix component of the selectively permeable glomerular filtration barrier (GFB) that separates the vasculature from the urinary space. The GBM lies between, and is initially synthesized by, the glomerular capillaries and the podocytes that sit on the opposite side of the GBM within the urinary space.

▶ Glomerular capillary membrane is composed of 3 layers

— ① Endothelium layer: It's the first layer in the wall of capillary composed of numerous pore having diameter 8 nm.

② Basement membrane: It's the middle layer of GCM, composed of collagen fibre and proteoglycan.

③ Epithelium: It's the outer layer of GCM towards bowman space surrounded by pedicells and bowman's capsule

Q. GLOMERULAR FILTRATION RATE (GFR):

Glomerular filtration rate (GFR) is the measure that describes the total amount of filtration formed by all the renal corpuscles in both proportional to the pressure gradient in the glomerulus. So, changes in pressure will change GFR.

- GFR is also an indicator of urine production, increased GFR will increase urine production, and vice versa.
- The starling equation for GFR is:

GFR = Filtration Constant × (Hydrostatic Glomerulus Pressure − Hydrostatic Bowman's Capsule Pressure) − (Osmotic Glomerulus Pressure + Osmotic Bowman's Capsule Pressure)

- The filtration constant is based on the surface area of the glomerular capillaries, and the hydrostatic pressure is a pressure is a pushing force exerted from the flow of a fluid itself; osmotic pressure is the pulling force exerted by proteins. Changes in either the hydrostatic or osmotic pressure in the glomerulus or Bowman's capsule will change GFR.

... is the outermost

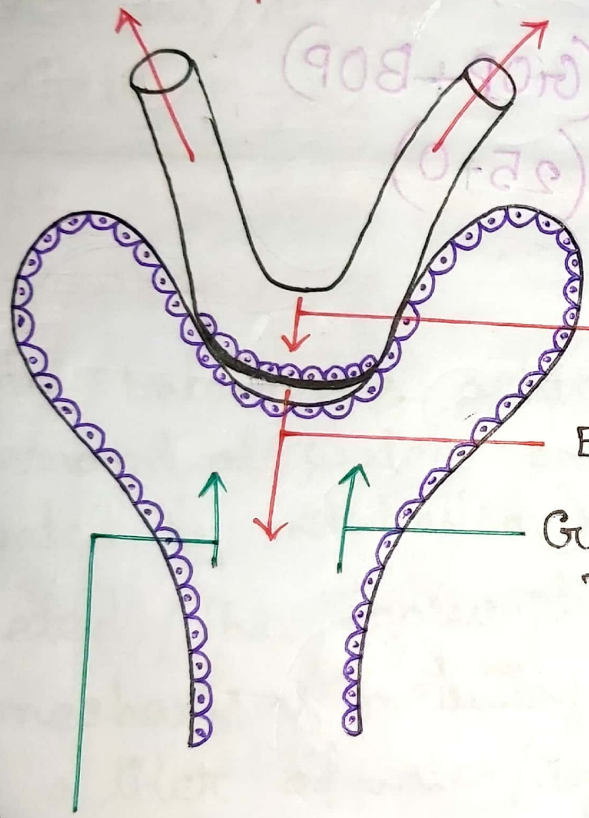
Energy — Low conc.

Requires energy — Molecules are pumped across the membrane

Low conc.

No requires energy — molecules are flows across the membrane by diffusion

Q. Pressure points in the glomerulus.



Glomerular capillary hydrostatic pressure

Effective filtration pressure (EFP)

Glomerular Colloidal Osmotic Pressure (25 mm Hg)

Bowman's space hydrostatic pressure (10mmHg)

Fig: Glomerulus filtration pressure

ULTRA FILTRATION

Favouring Pressure

- Glomerular Capillary hydrostatic pressure (45 mm Hg) [GCP]

Opposing Pressure

- Glomerular Colloidal Osmotic Pressure (25 mm Hg) [GOP]
- Bowman's Space Oncotic pressure (0 mm Hg)
- Bowman's capsule hydrostatic pressure [CHP] (10 mm Hg)

$$EFP = (GCP - (GOP + CHP)) \text{ mm Hg}$$
$$= 45 - (25 + 10) \text{ mm Hg}$$
$$= 10 \text{ mm Hg}$$

* Filtration Co-efficient (Kf) (normal) = 12.5 $m^2/min/mm\ Hg$

* $GFR = Kf\,(GCP - CHP) - (GOP + BOP)$
$= 12.5\,(45 - 10) - (25 + 0)$
$= 125 \text{ ml/min}$

Q. Write the composition of urine.

Urine

Organic Compound (24hr)

- Nitrogen (25 - 30gm)
- Urea (25 - 30gm)
- Amonia (0.7gm)
- Uric acid (0.7gm)
- Amino acid (0.15gm)
- Oxalic acid (15-20gm)
- Vitamins (0.7gm)
- Phenol compound (0.2gm)
- Hormones and enzymes (little amount/absent)
- Keton bodies (Absent/ little amount)

Inorganic Compound (24hr)

- Chloride (6-9gm)
- NaCl (20-25gm)
- KCl (25-30gm)
- Na (4-5gm)
- Potssium(K) (2.5-3.0gm)
- Ca (2.5-3 gm)
- Mg (0.1-0.2gm)
- Sulphate (0.8-1.4gm)
- Phosphate (0.8-1.3gm)
- Iodine (50-250ug)
- Arsenic and lead (50ug)