

RENAL/ REPRODUCTIVE LAB REVIEW

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Prince George community college

Tutoring Center Lago



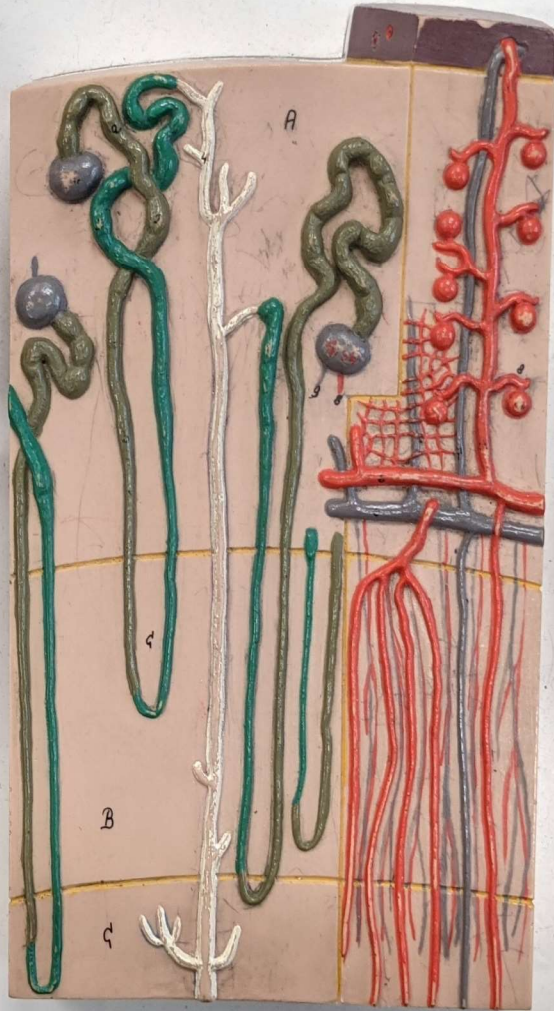
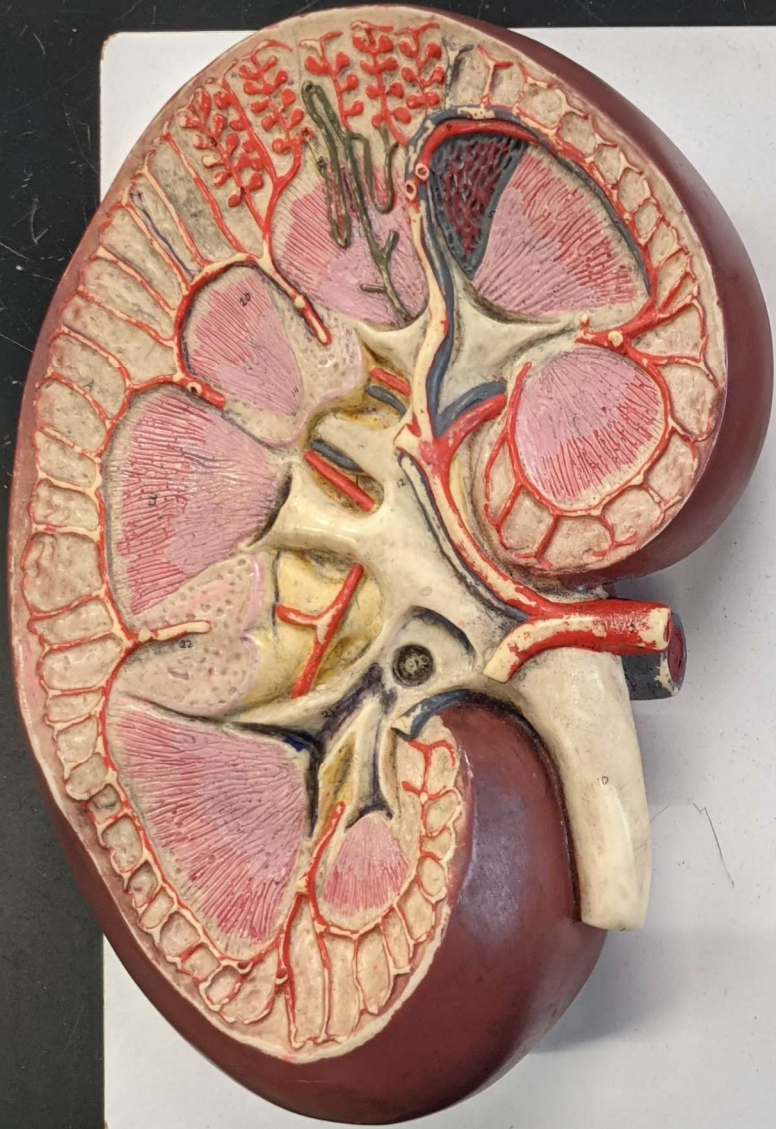
PRINCE GEORGE'S
COMMUNITY COLLEGE

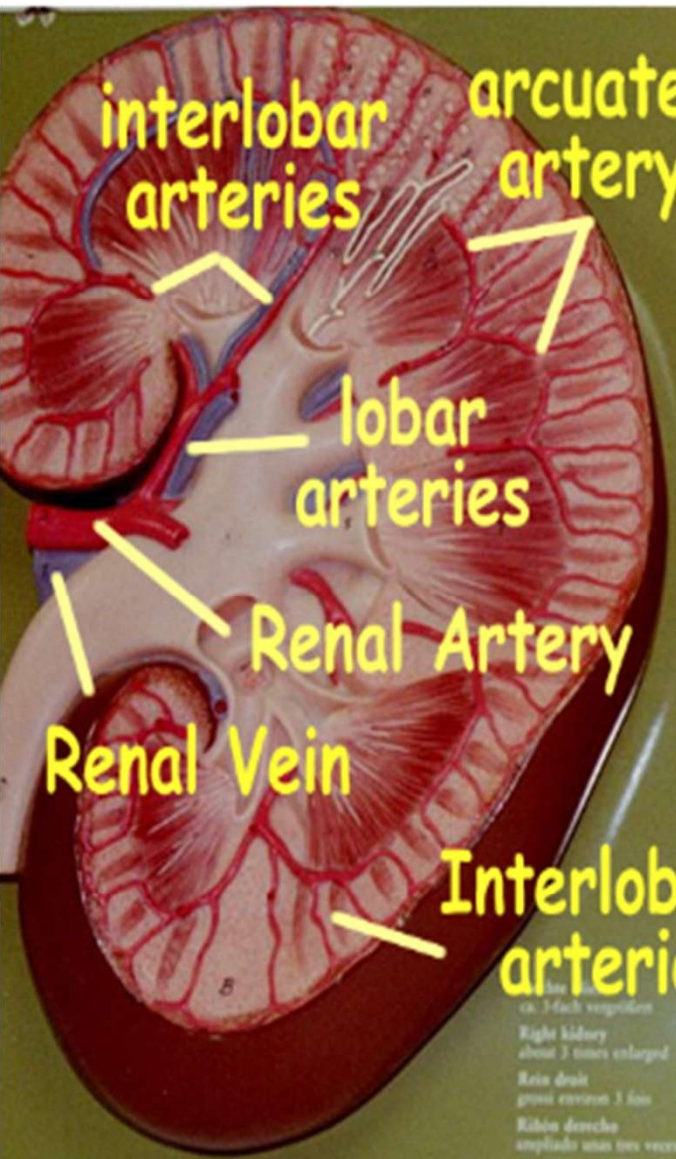
<http://sinoemedicalassociation.org/anatomyphysiology>

Overview of kidney functions?

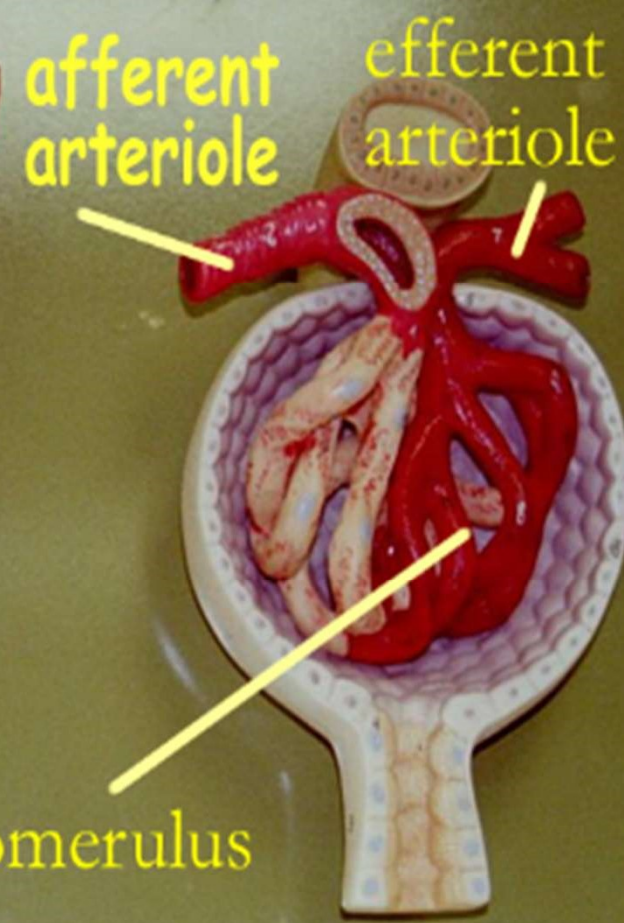
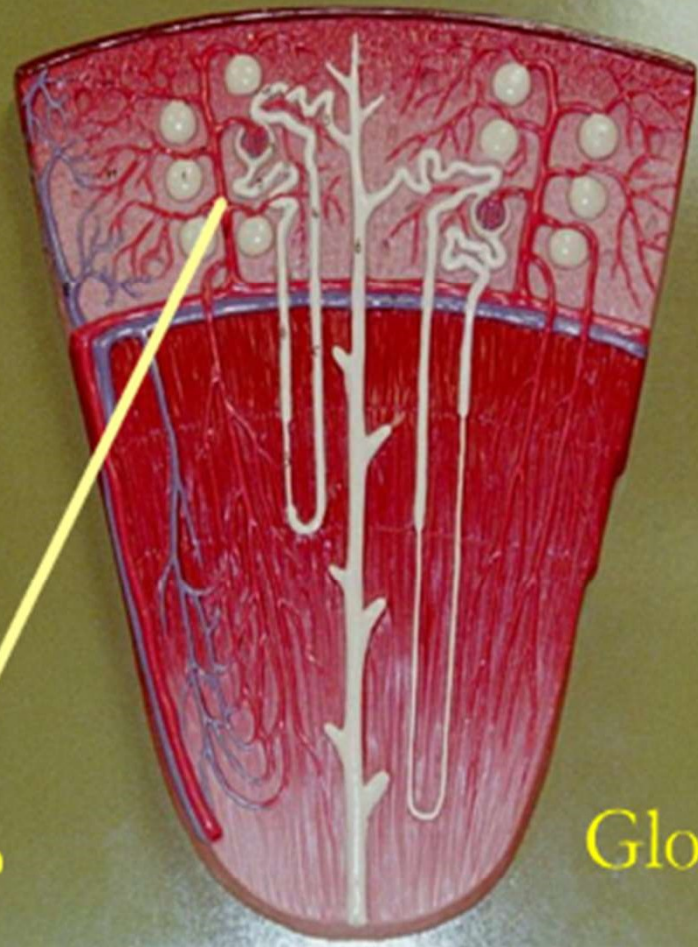
Overview of kidney functions

- Regulation of blood ionic composition
- Regulation of blood pH
- Regulation of blood volume
- Regulation of blood pressure
- Maintenance of blood osmolarity
- Production of hormones (calcitriol and erythropoietin)
- Regulation of blood glucose level
- Excretion of wastes from metabolic reactions and foreign substances (drugs or toxins)





ca. 3-fach vergrößert
 Right kidney
 about 3 times enlarged
 Rein droit
 grossi environ 3 fois
 Rññn derecha
 ampliado unas tres veces



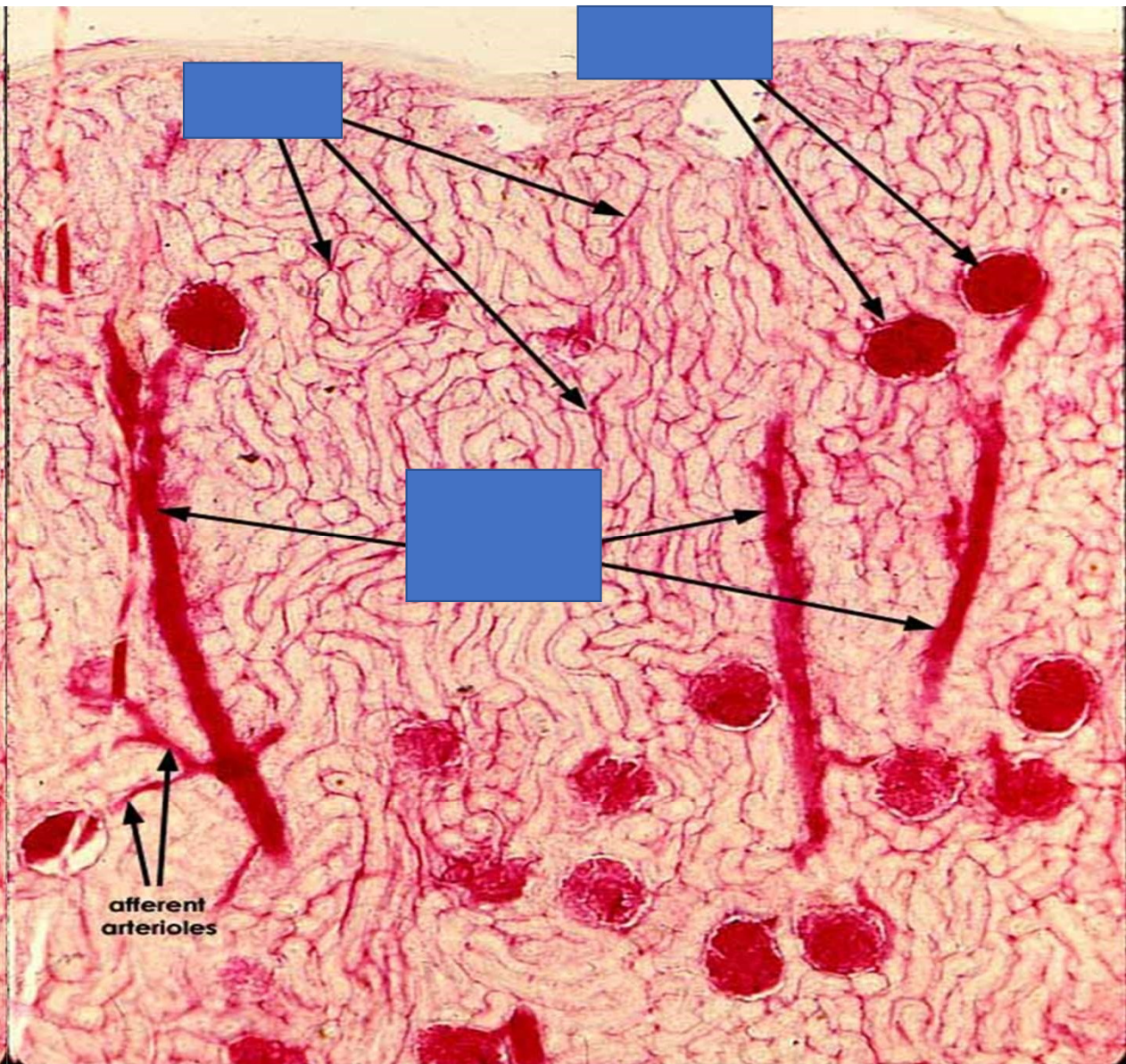
Nierenklopfchen
 ca. 700-fach vergrößert
 Capsule of the kidney
 alone 700 times enlarged
 Glomtrale de Malpighi
 grossi environ 700 fois
 Glomtrulo renal
 ampliado unas 700 veces

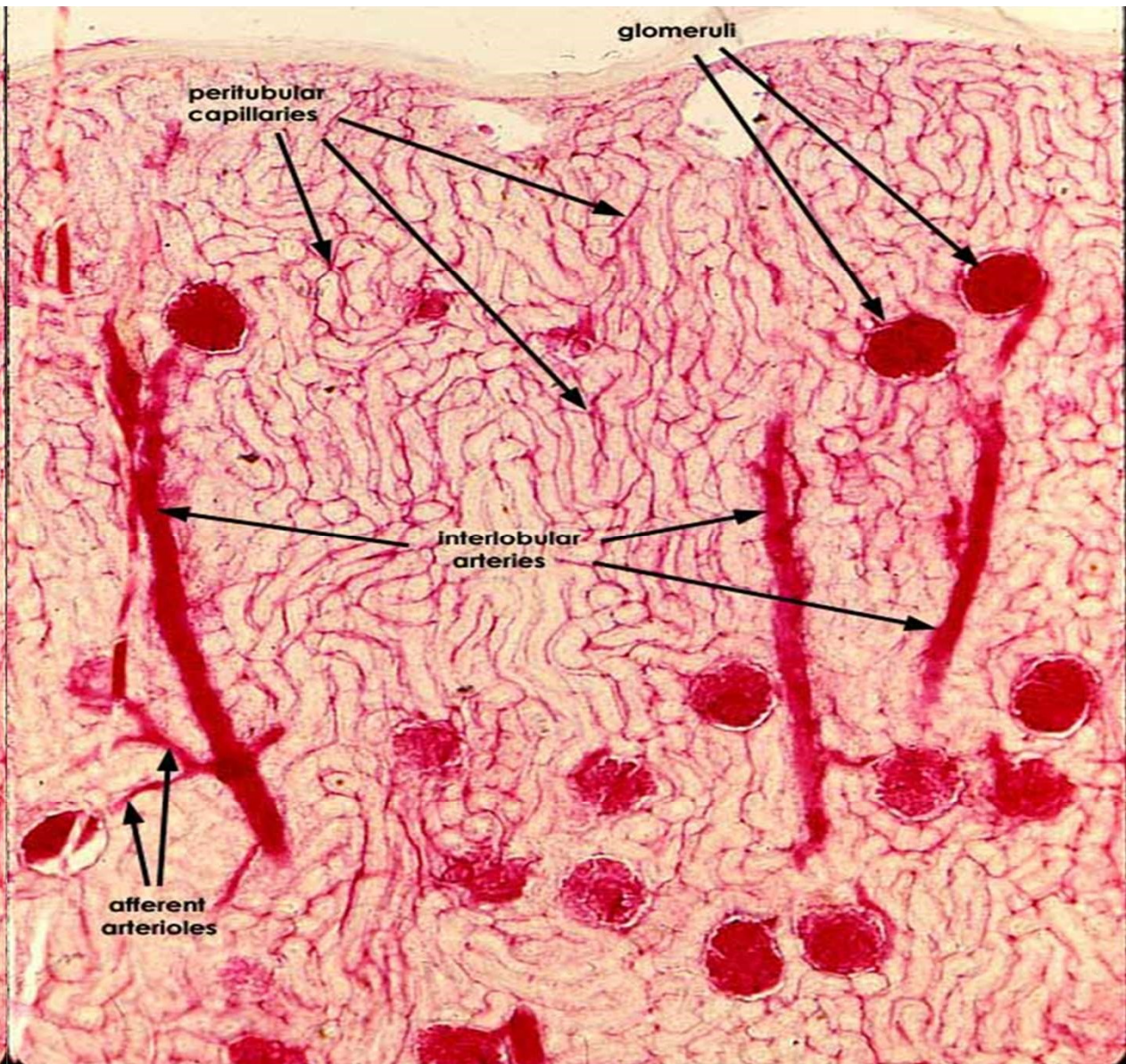
What is the functional unit of the kidney?

Nephron

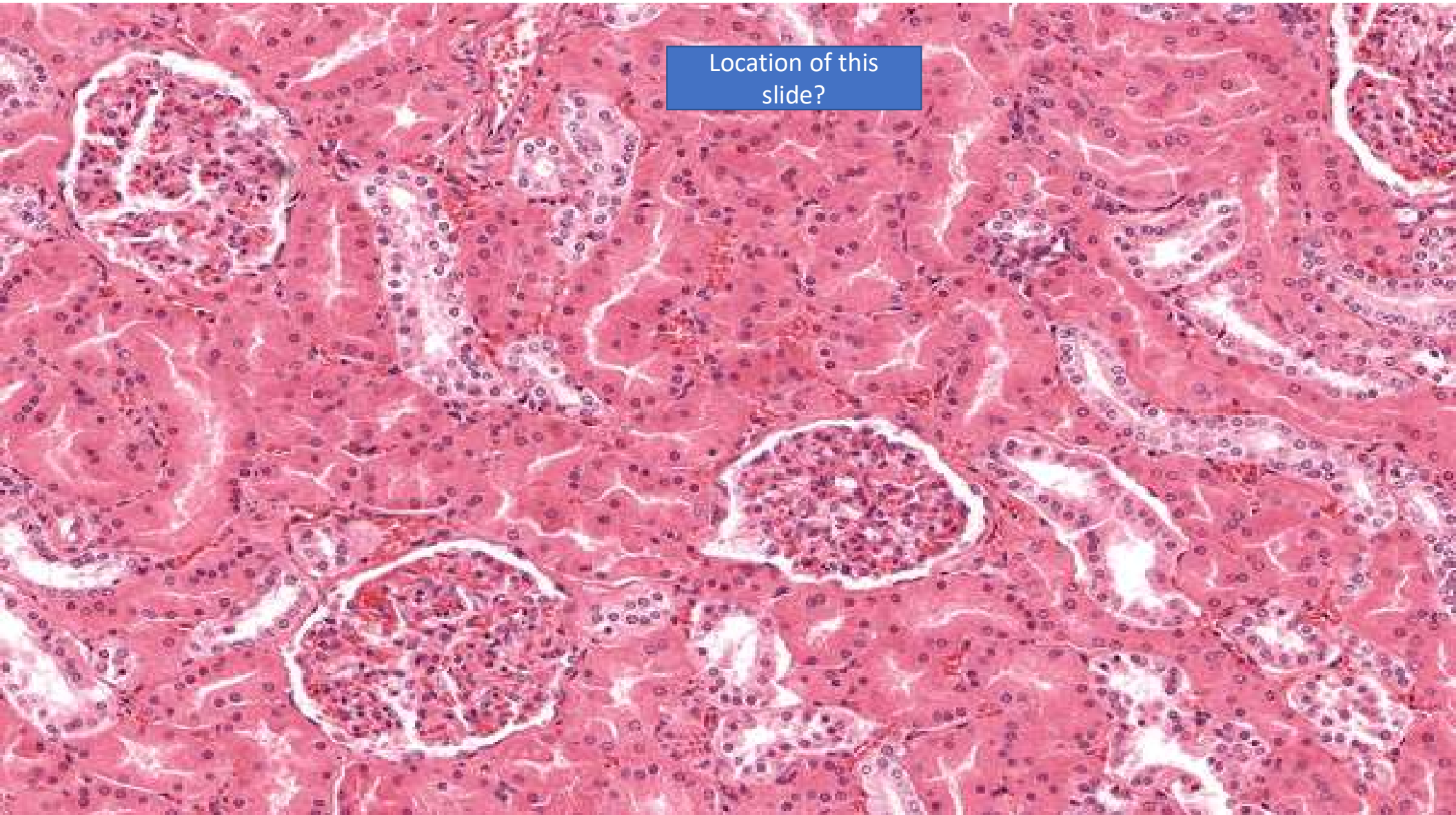
What are the 3 main functions of the nephron?

Filtration, reabsorption, secretion

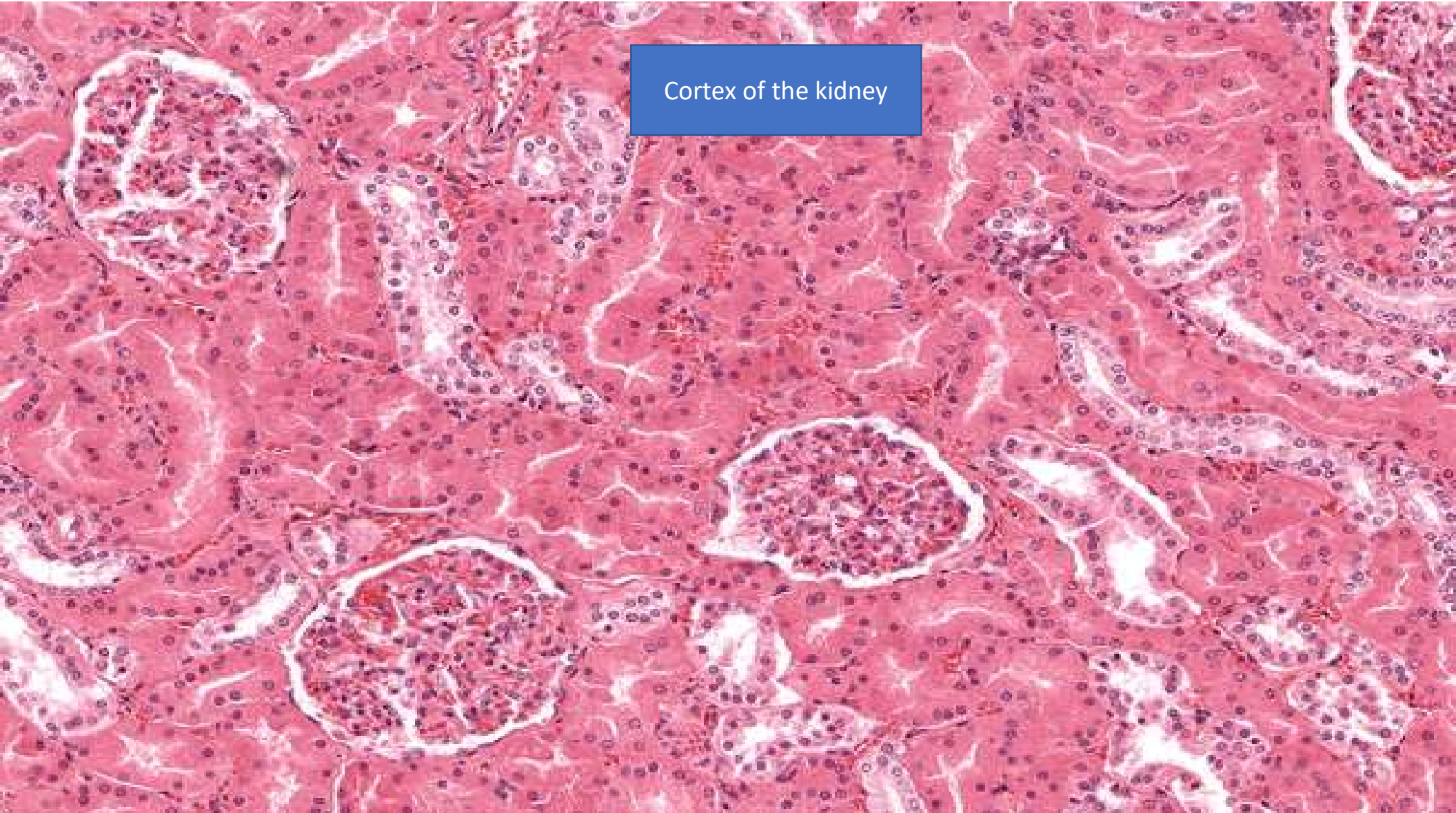




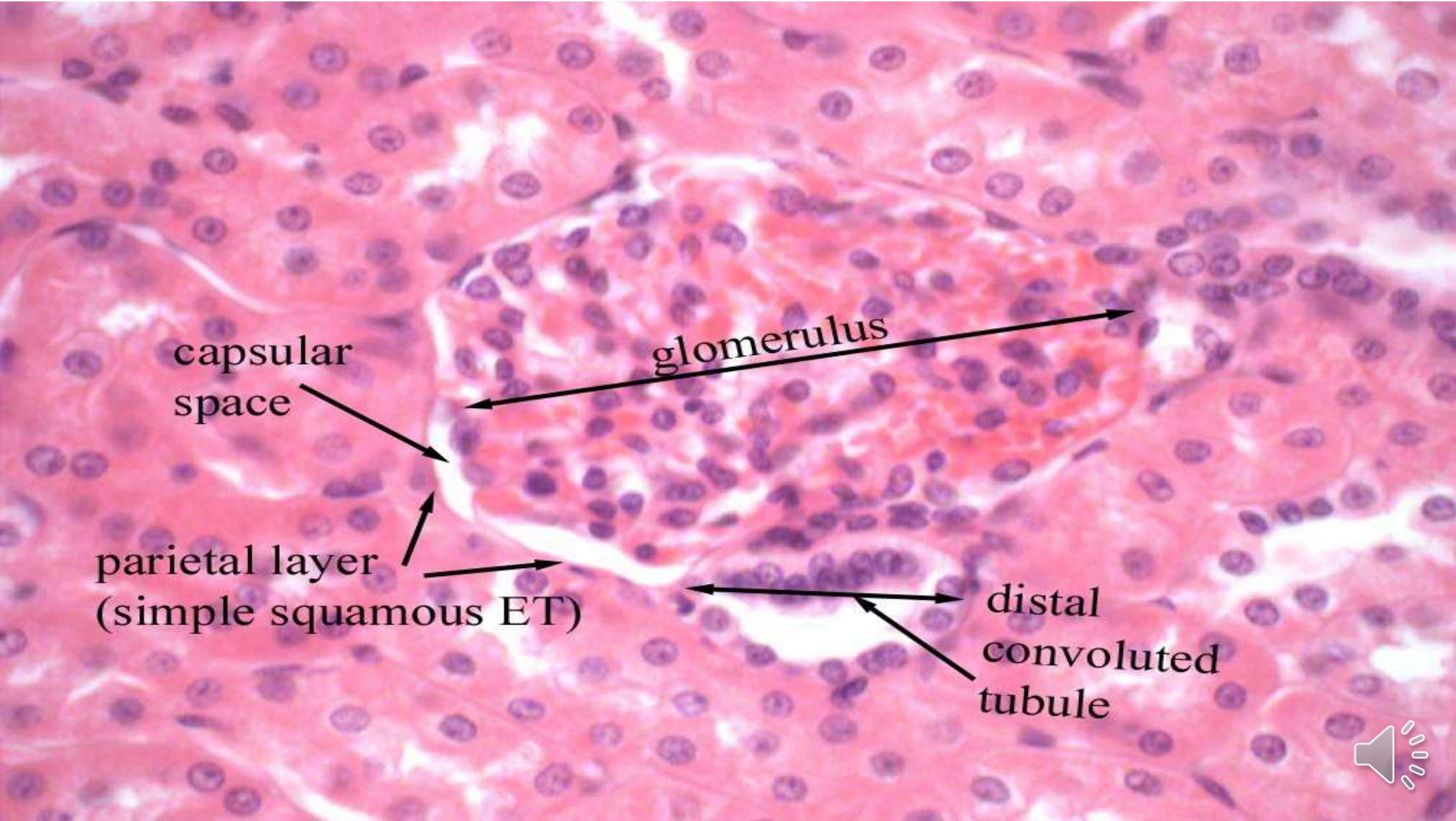
Location of this
slide?



Cortex of the kidney







capsular space

glomerulus

parietal layer
(simple squamous ET)

distal convoluted tubule

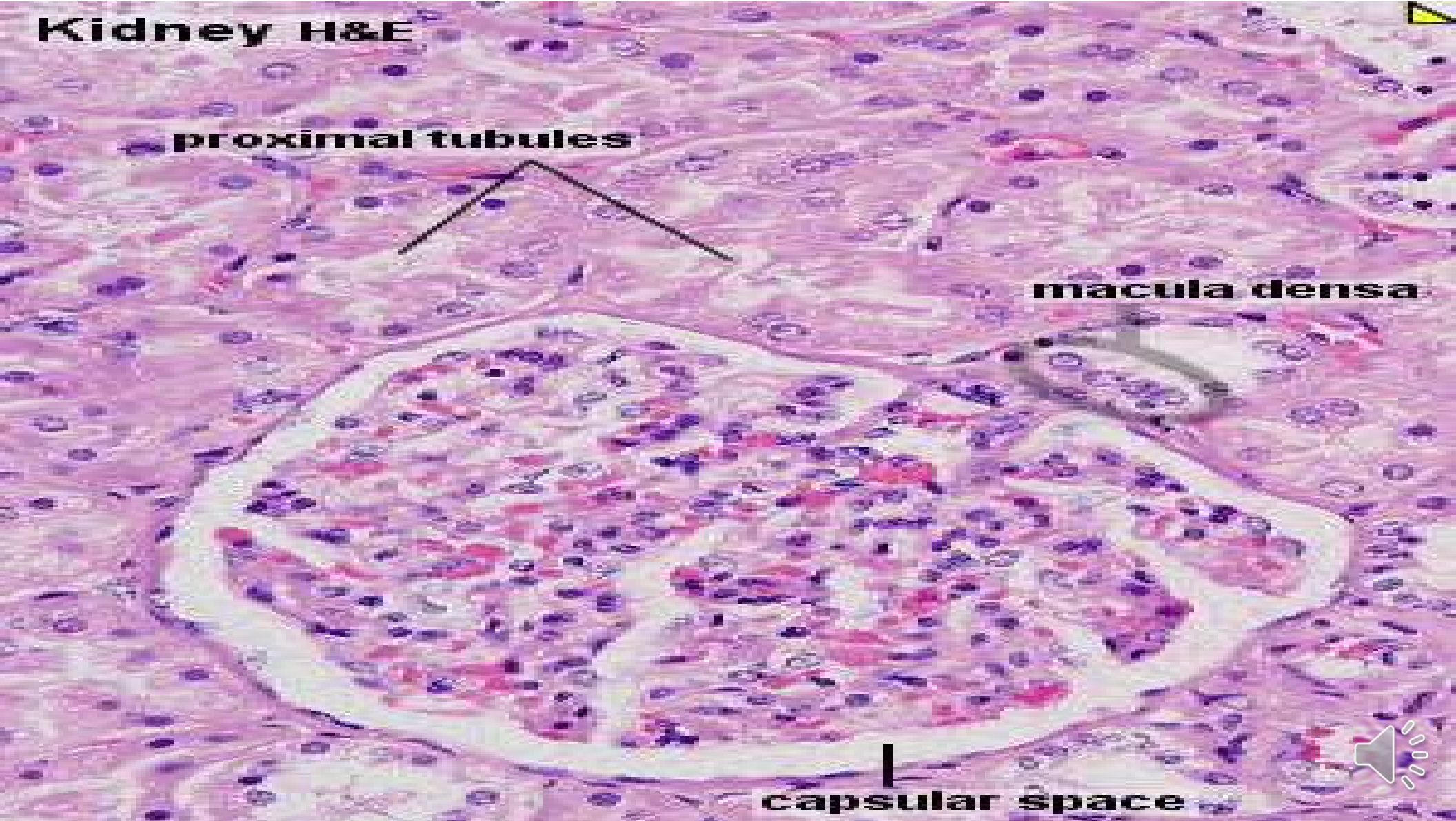


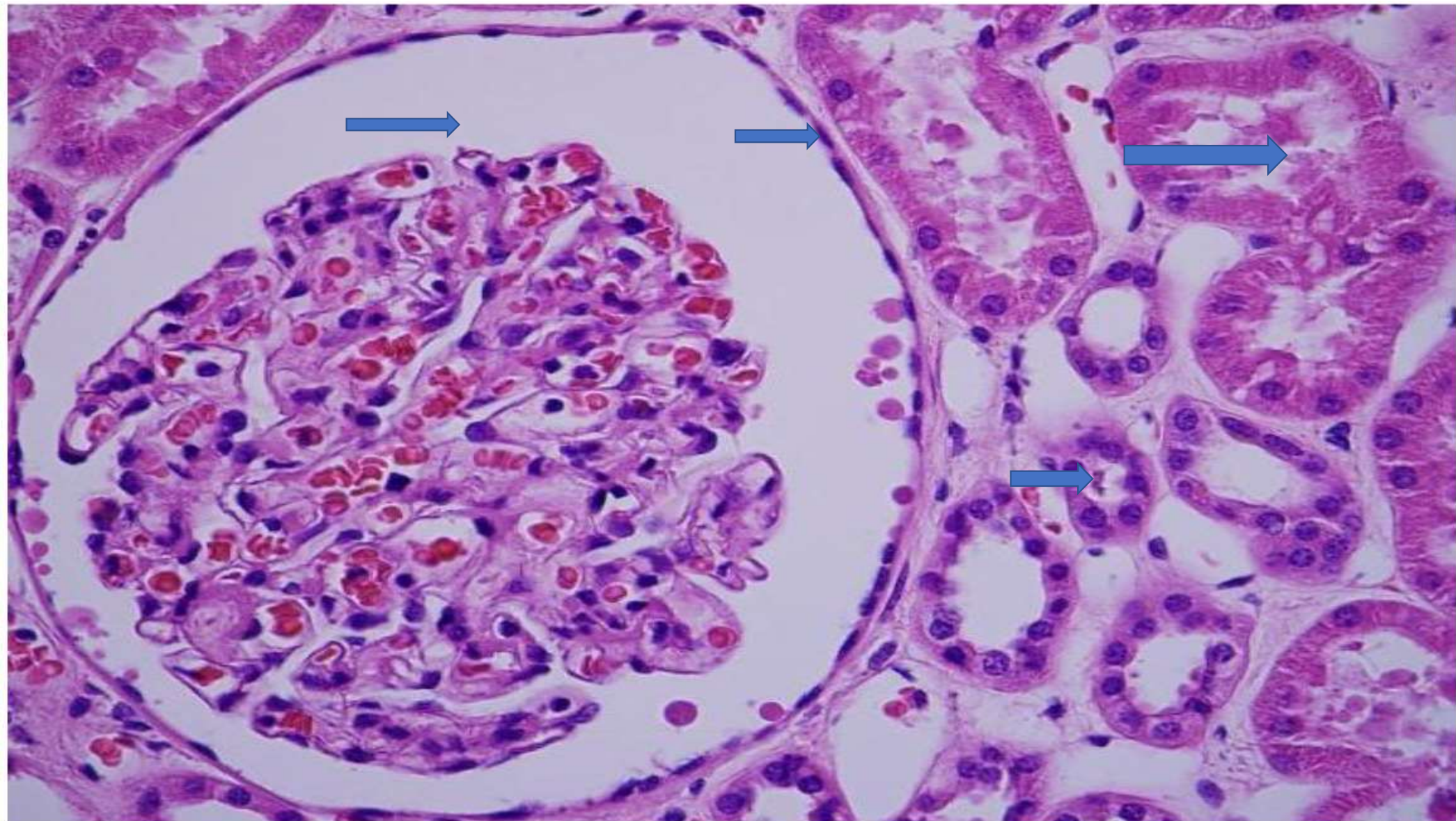
Kidney H&E

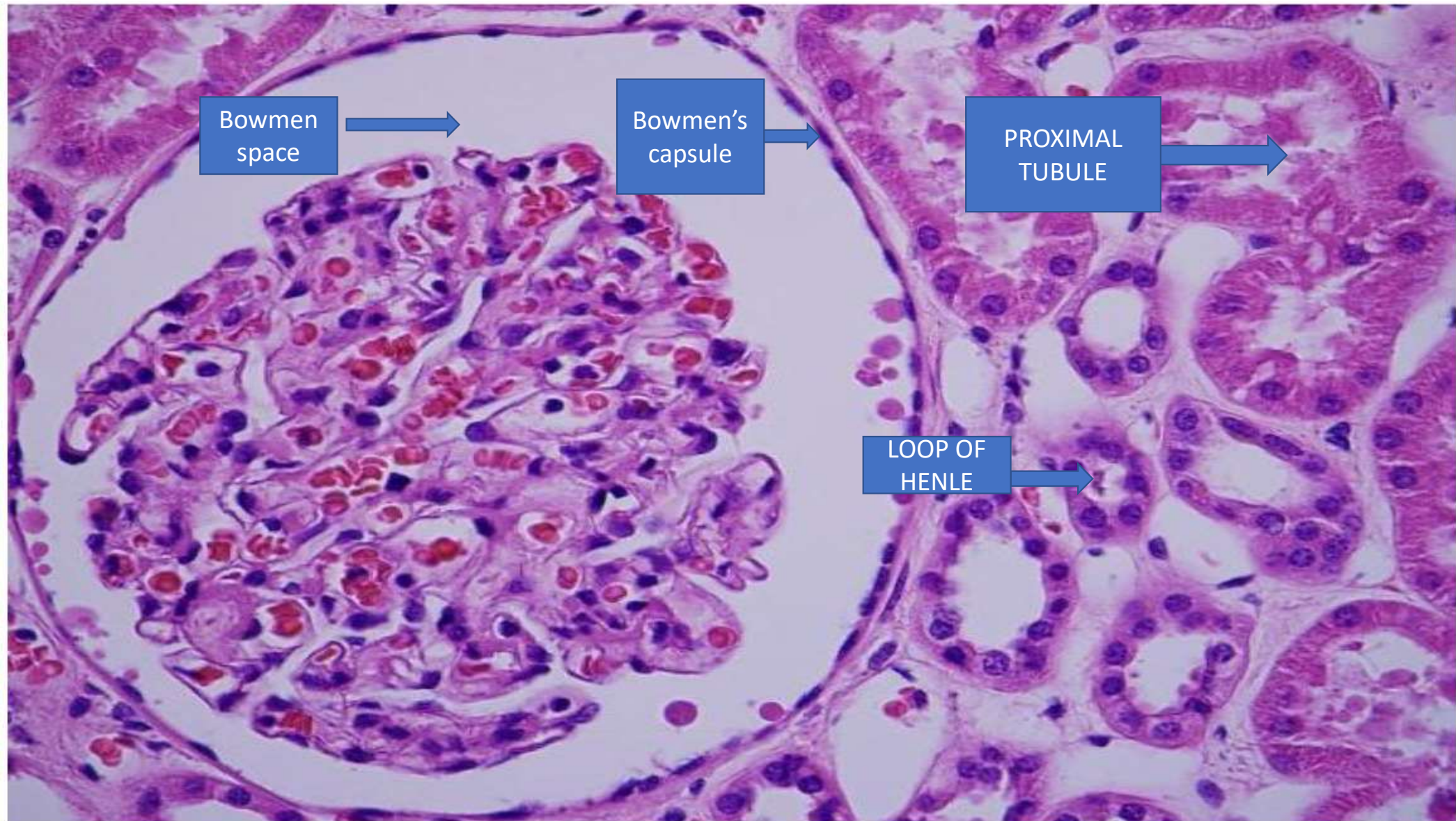
proximal tubules

macula densa

capsular space





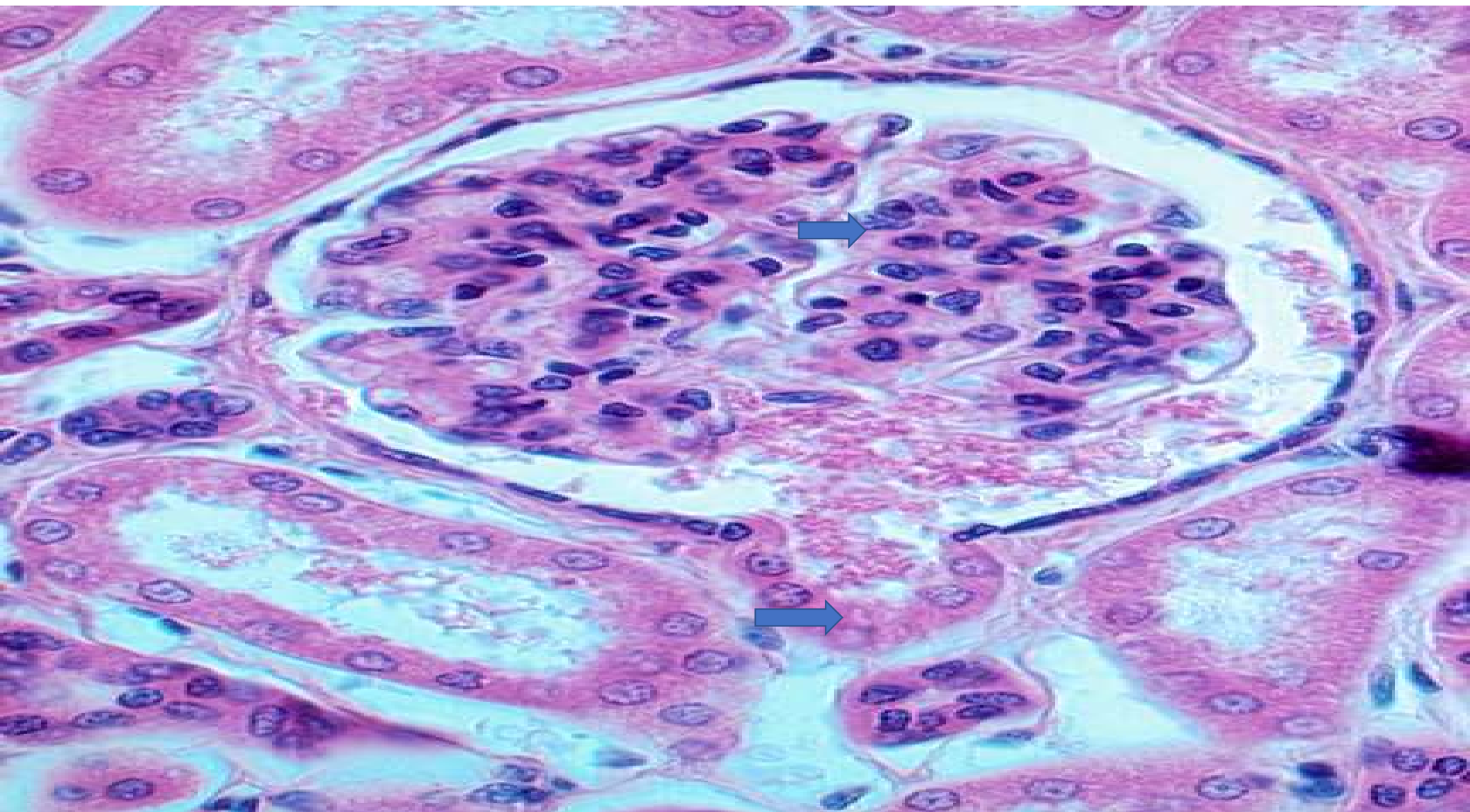


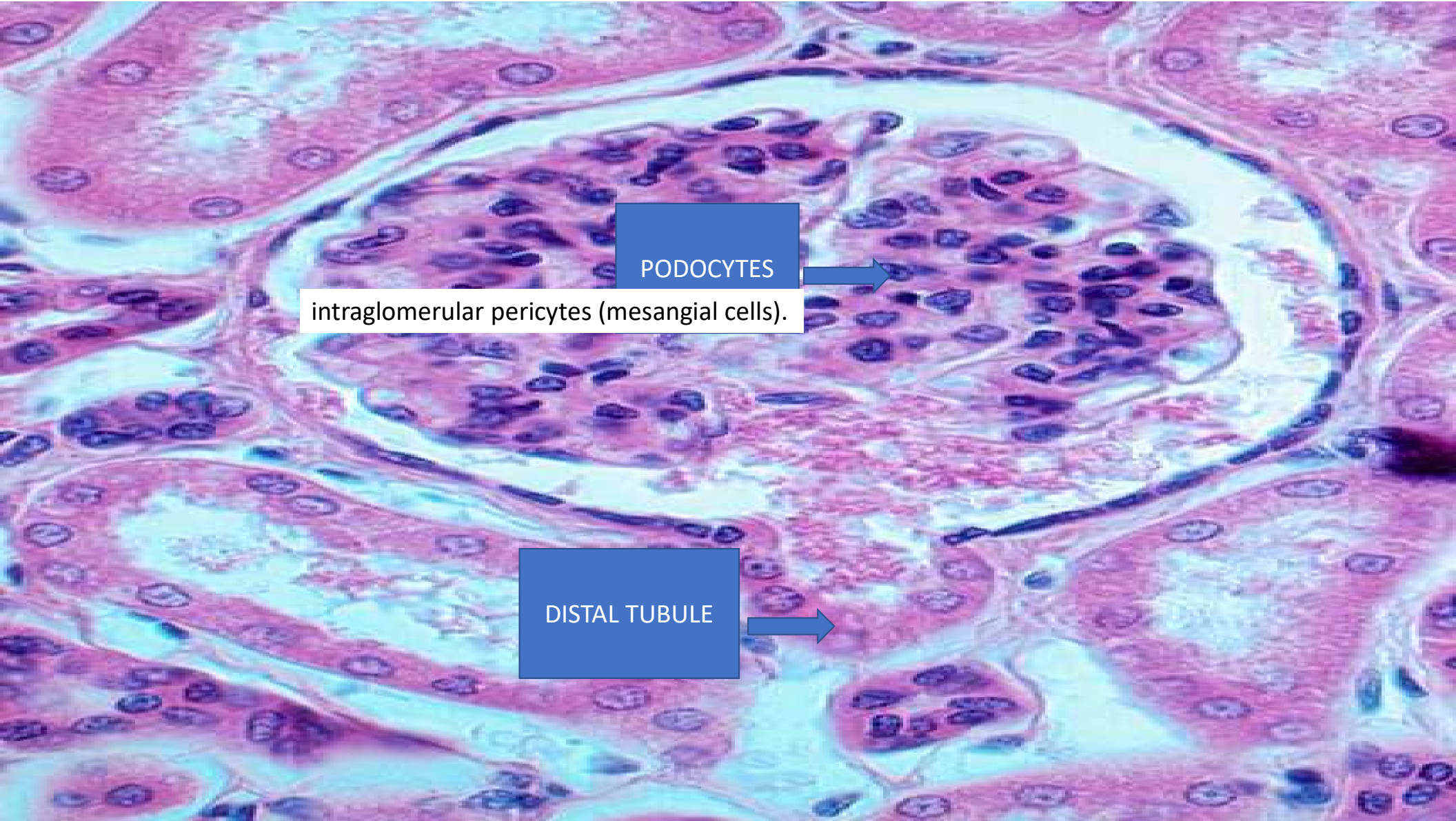
Bowmen
space

Bowmen's
capsule

PROXIMAL
TUBULE

LOOP OF
HENLE

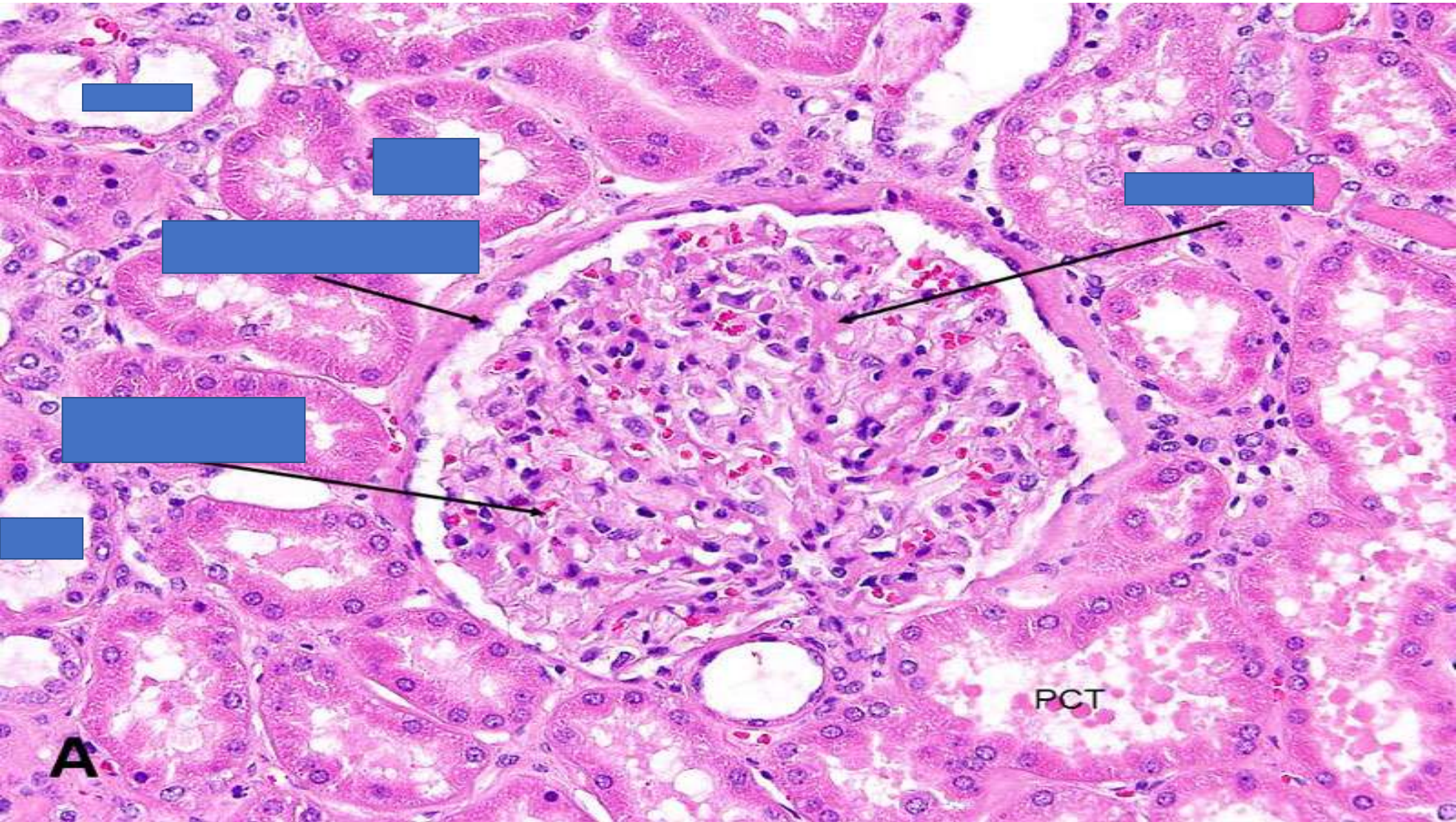


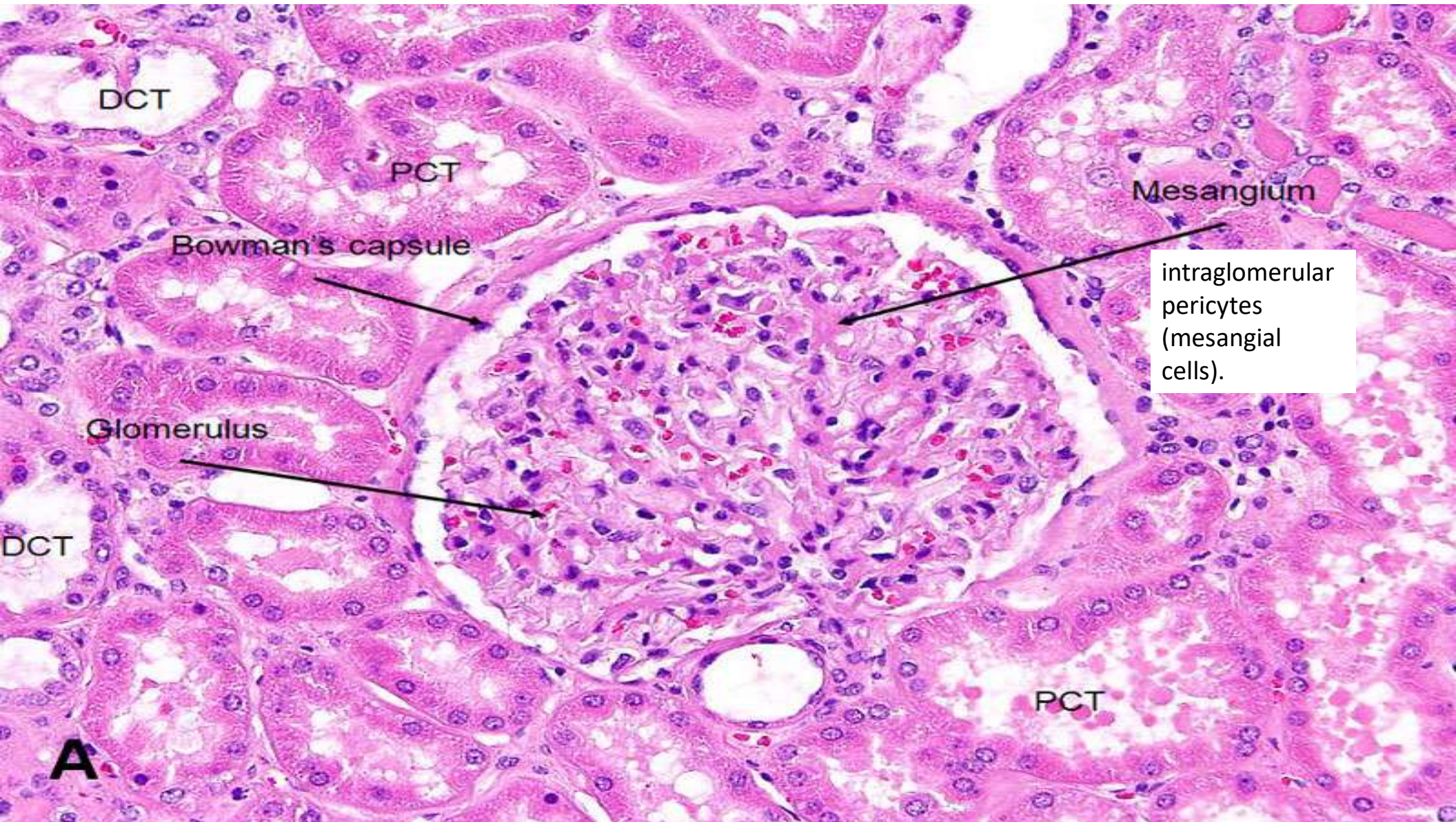


PODOCYTES

intraglomerular pericytes (mesangial cells).

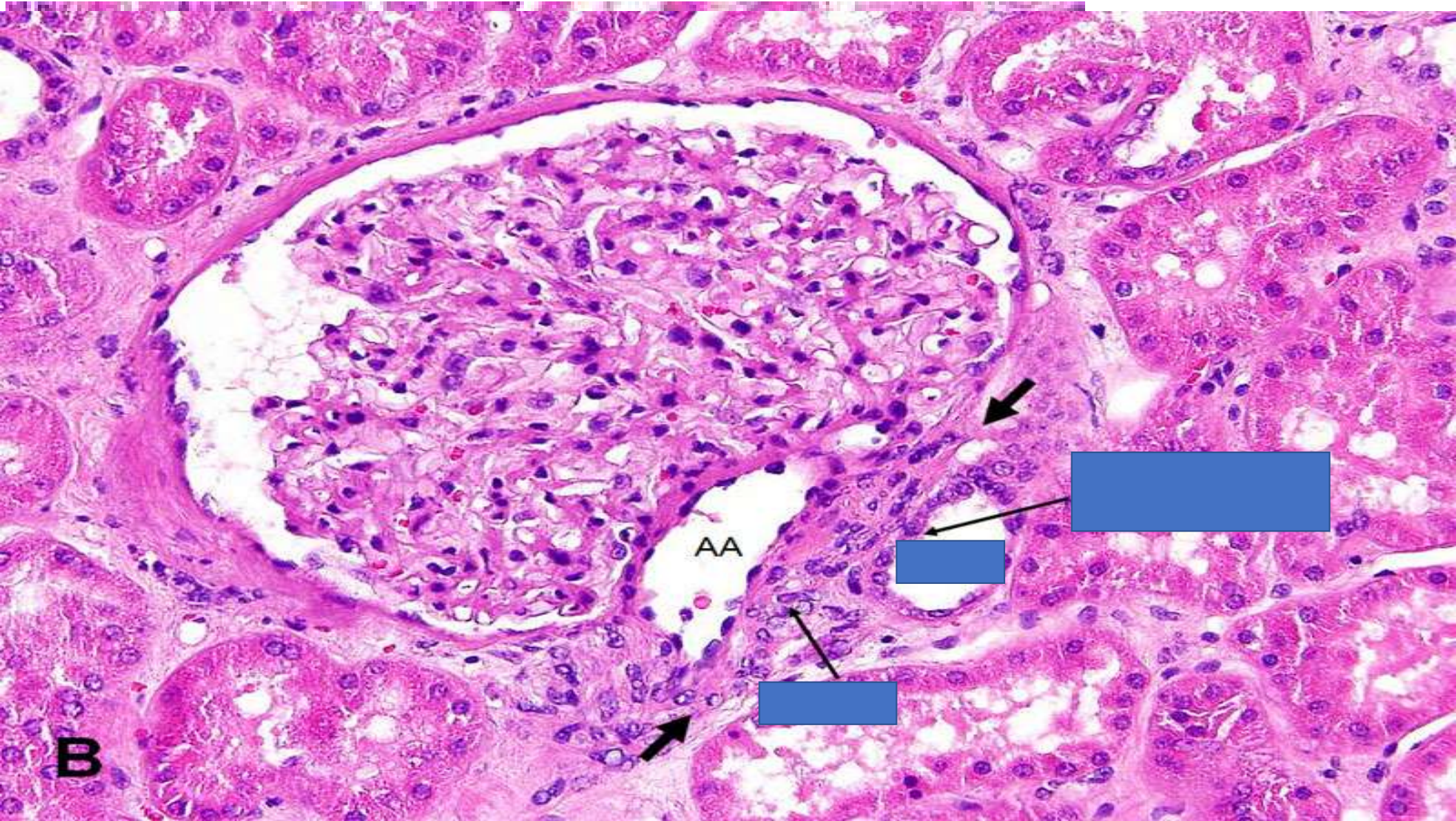
DISTAL TUBULE

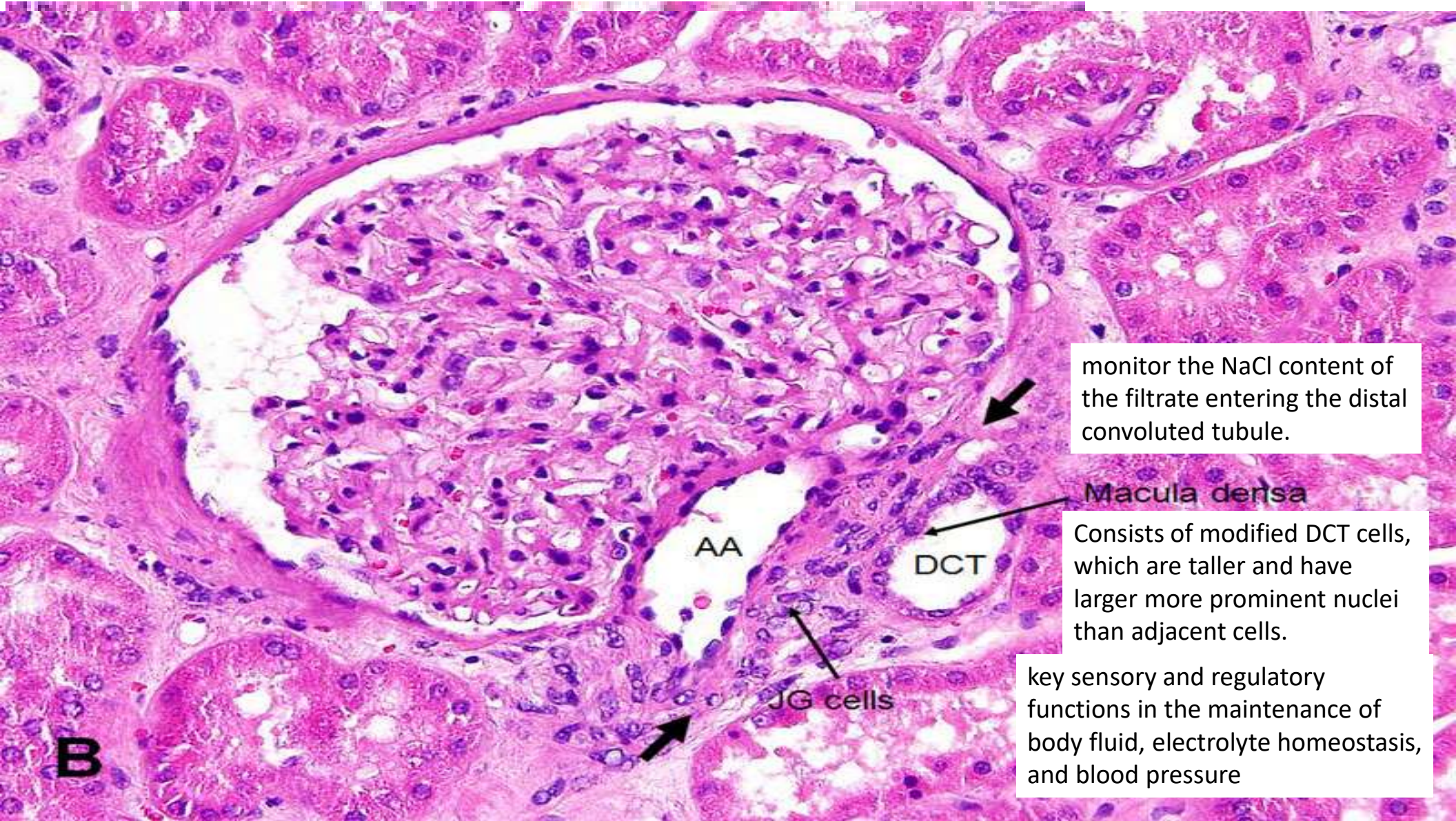




The renal corpuscle consists?

The renal corpuscle consists of Bowman's capsule and glomerular capillaries, responsible for plasma filtration





monitor the NaCl content of the filtrate entering the distal convoluted tubule.

Macula densa

Consists of modified DCT cells, which are taller and have larger more prominent nuclei than adjacent cells.

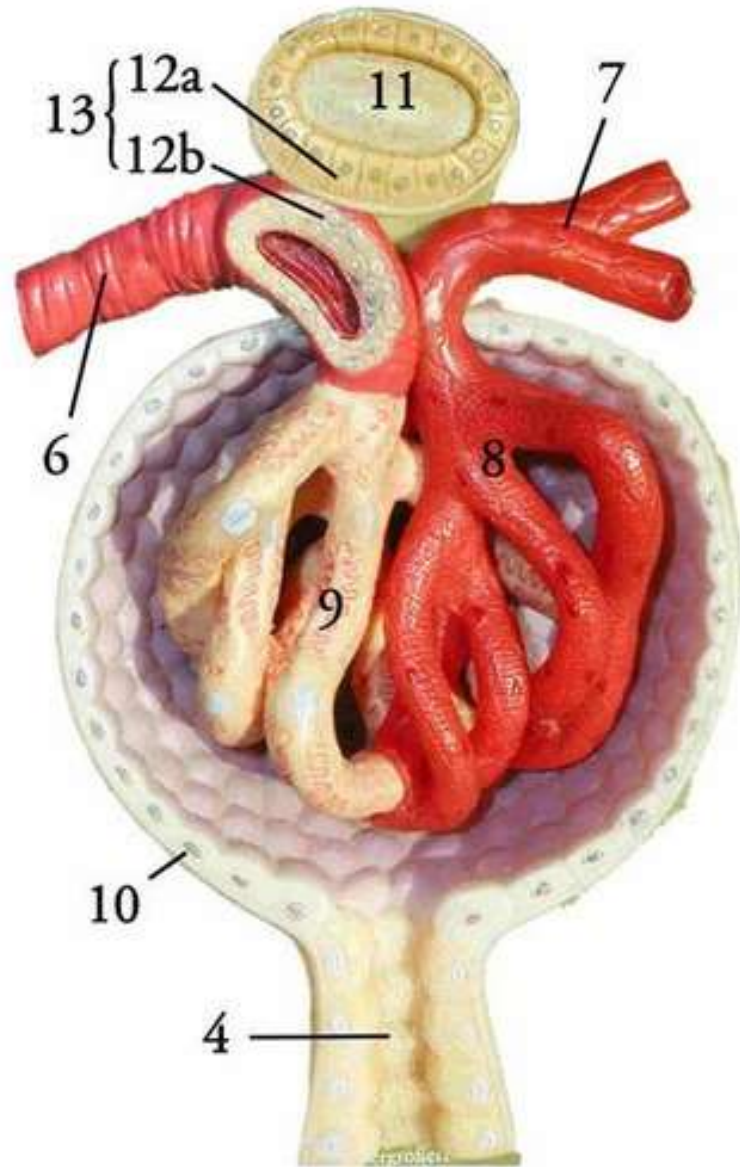
key sensory and regulatory functions in the maintenance of body fluid, electrolyte homeostasis, and blood pressure

AA

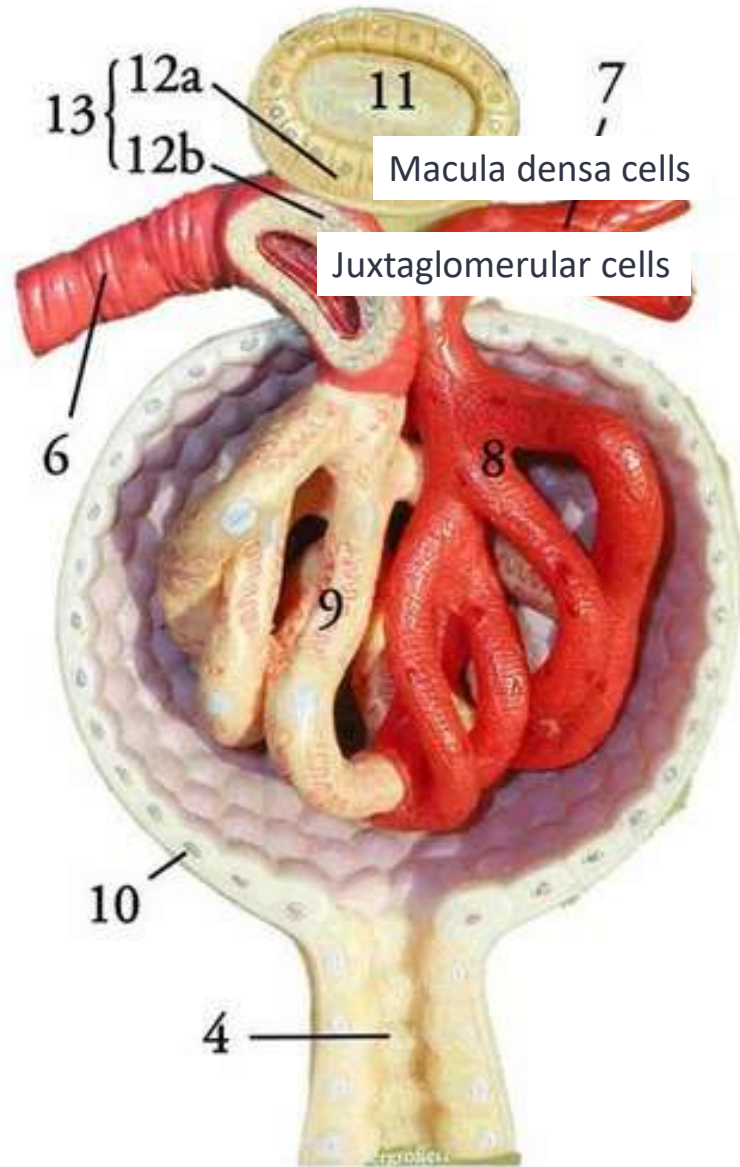
DCT

JG cells

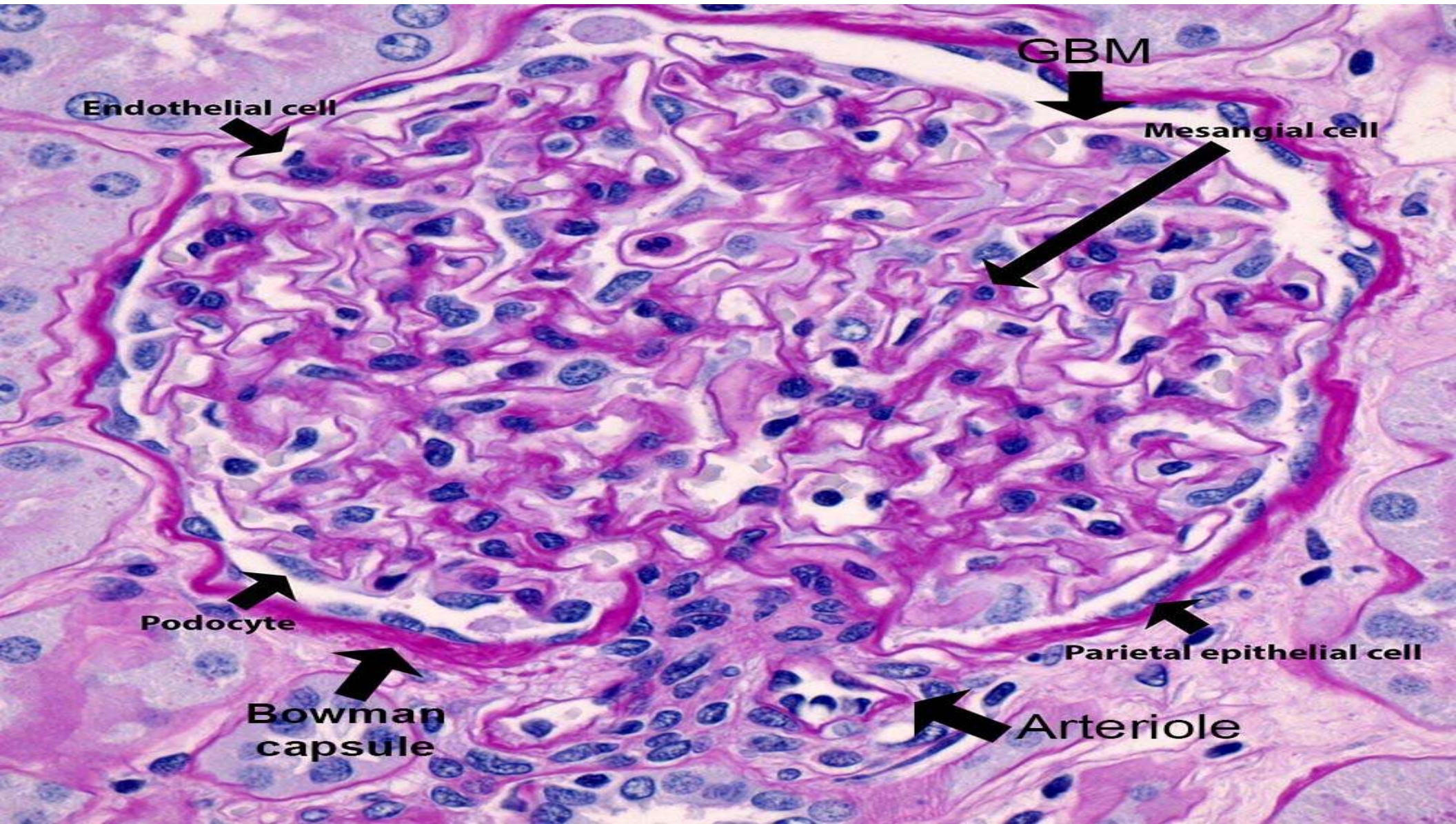
B

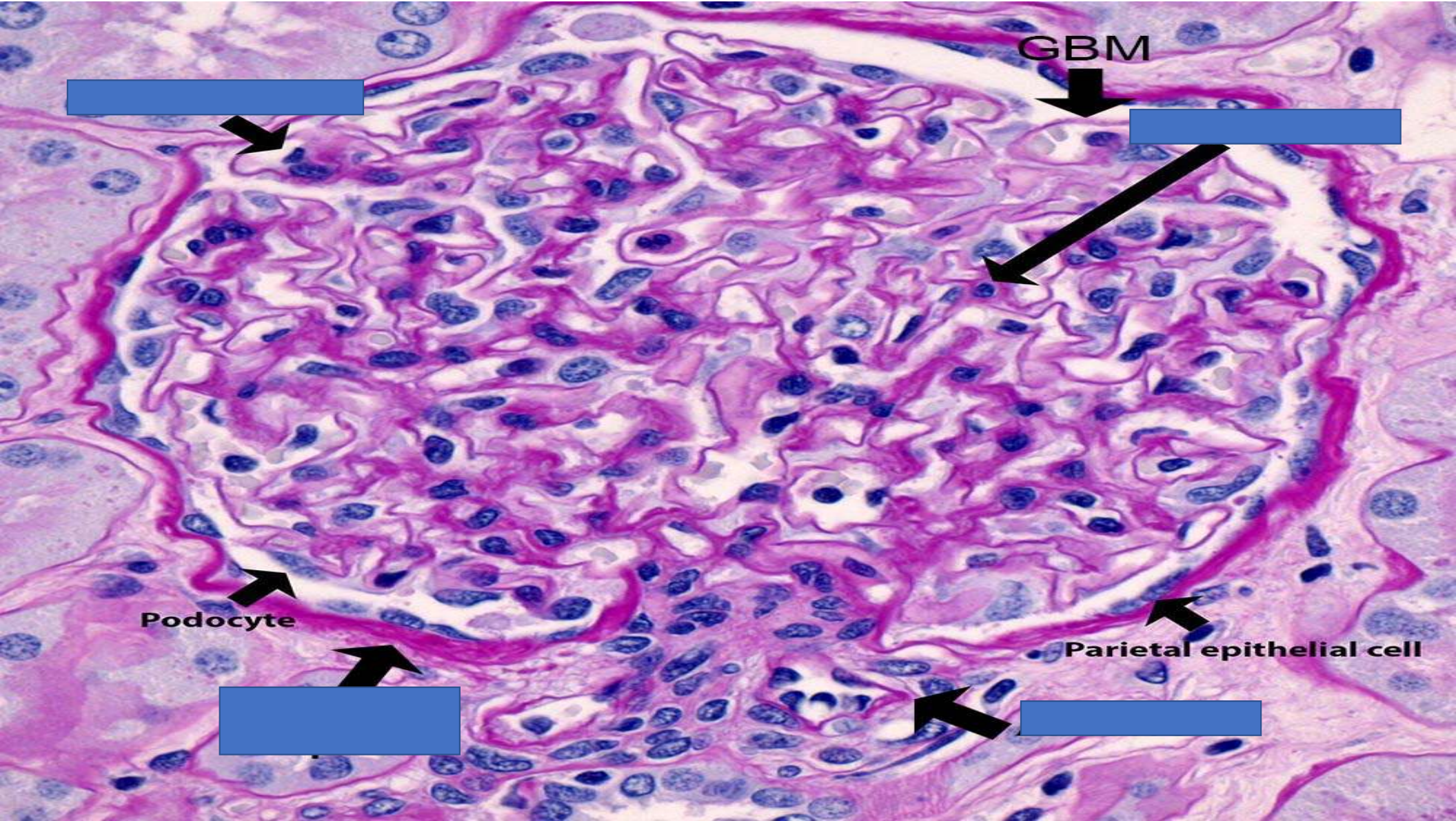


12a
12b

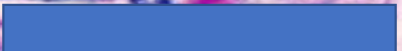
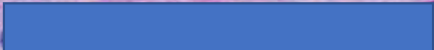


12a





GBM

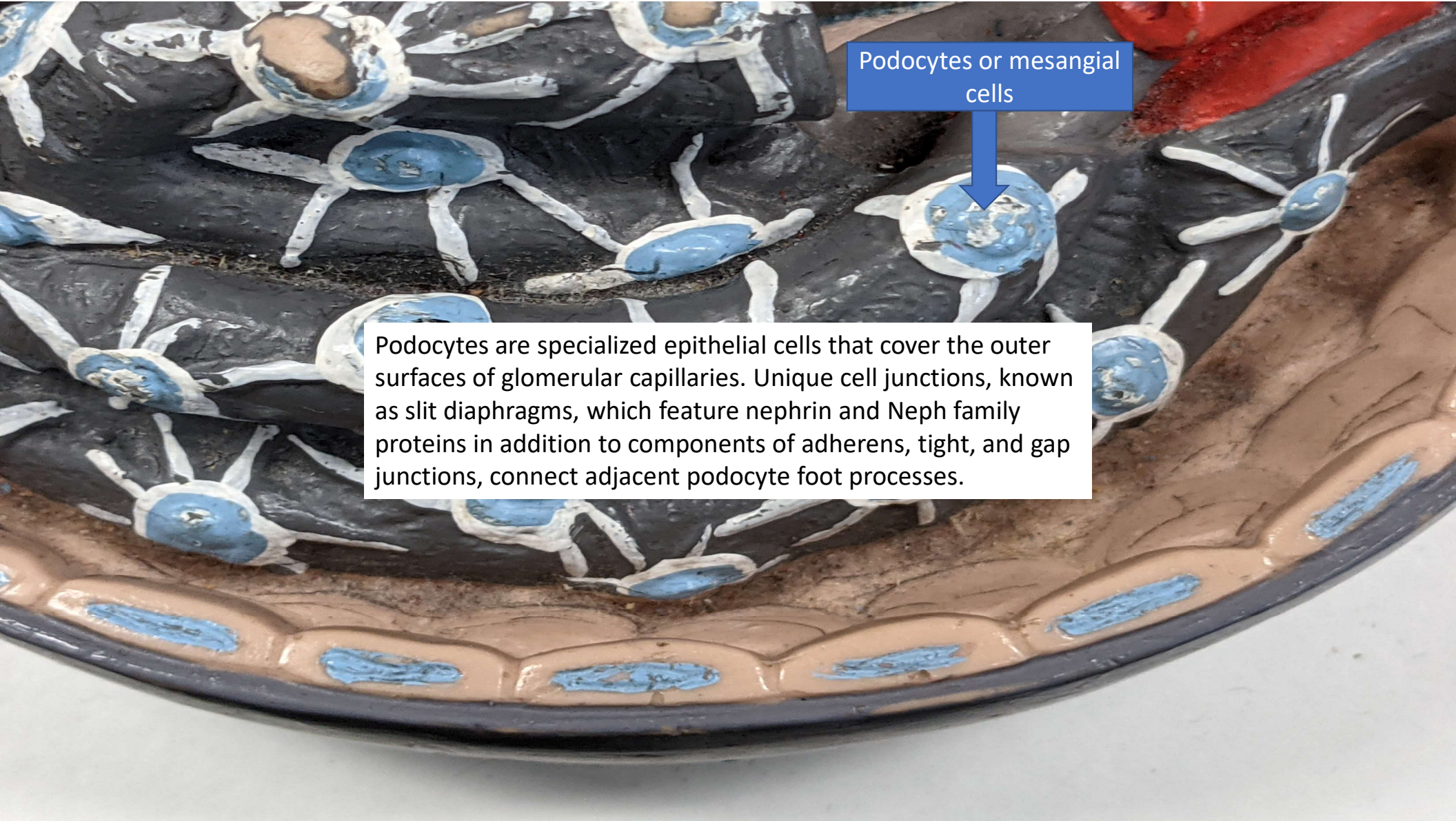


Podocyte

Parietal epithelial cell

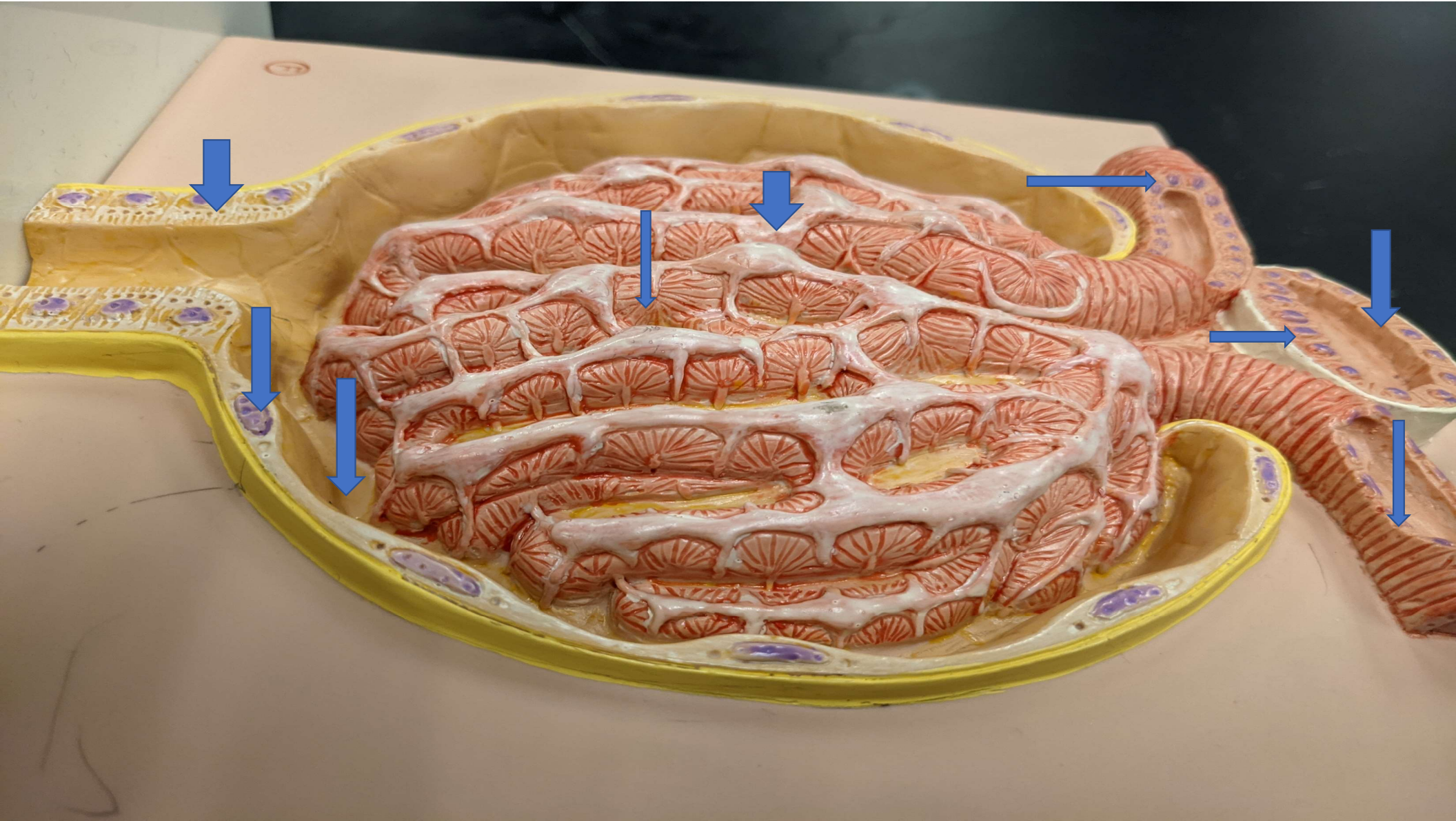


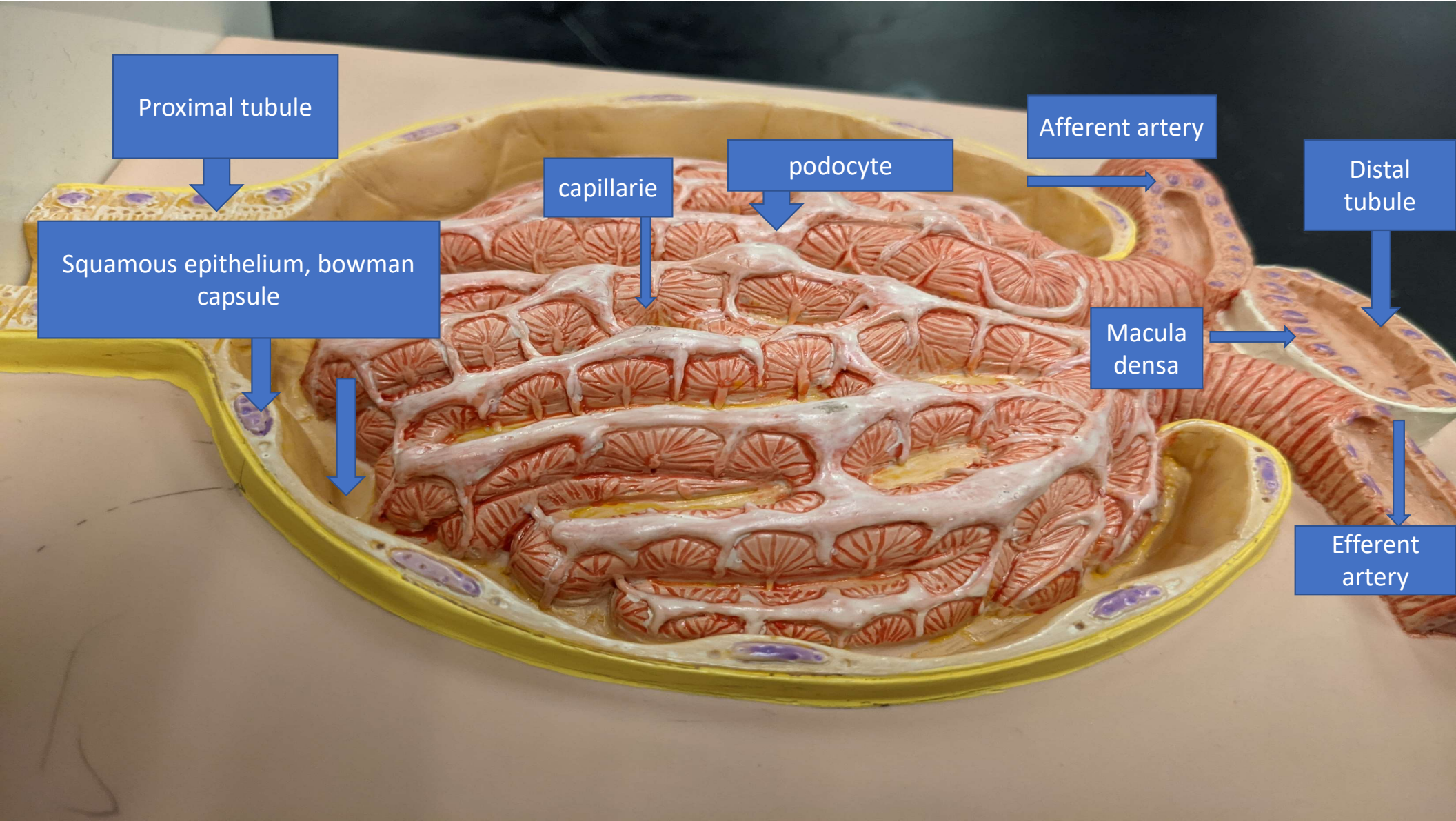




Podocytes or mesangial cells

Podocytes are specialized epithelial cells that cover the outer surfaces of glomerular capillaries. Unique cell junctions, known as slit diaphragms, which feature nephrin and Neph family proteins in addition to components of adherens, tight, and gap junctions, connect adjacent podocyte foot processes.





Proximal tubule

Squamous epithelium, bowman capsule

capillarie

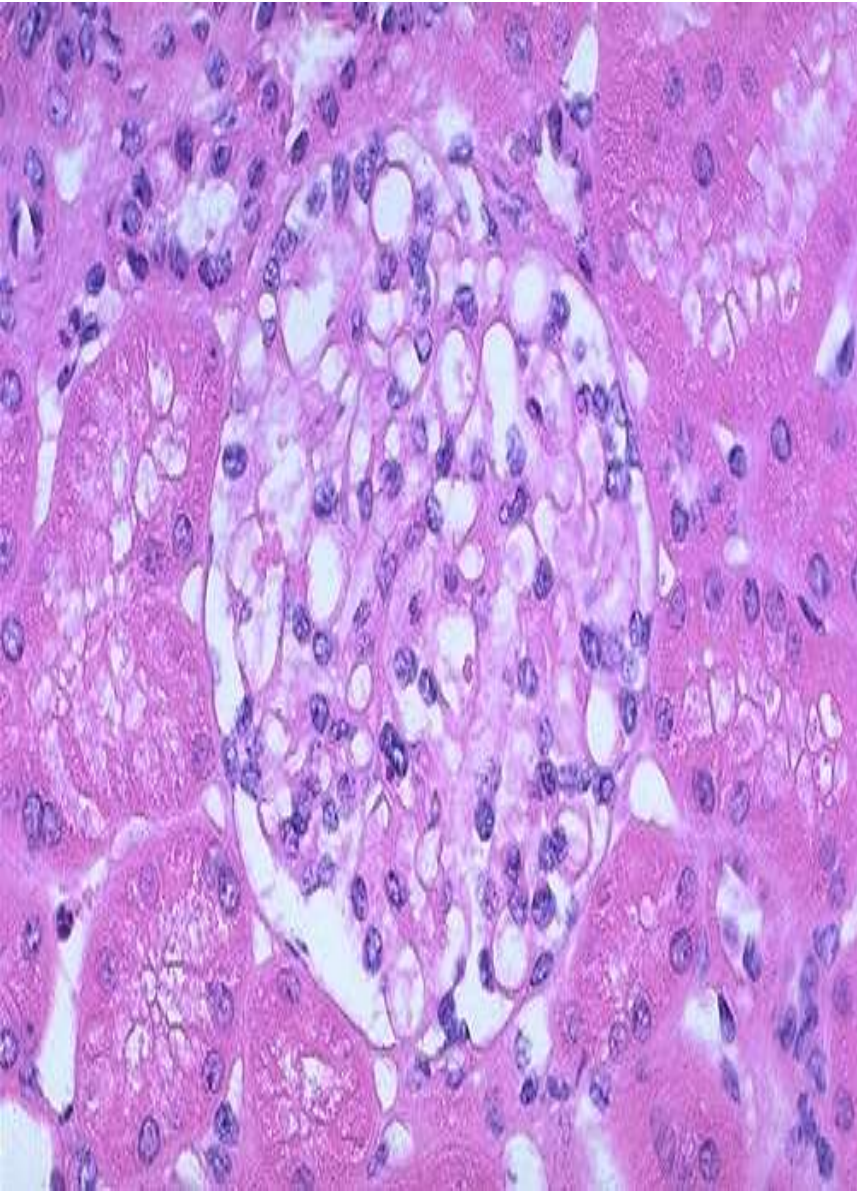
podocyte

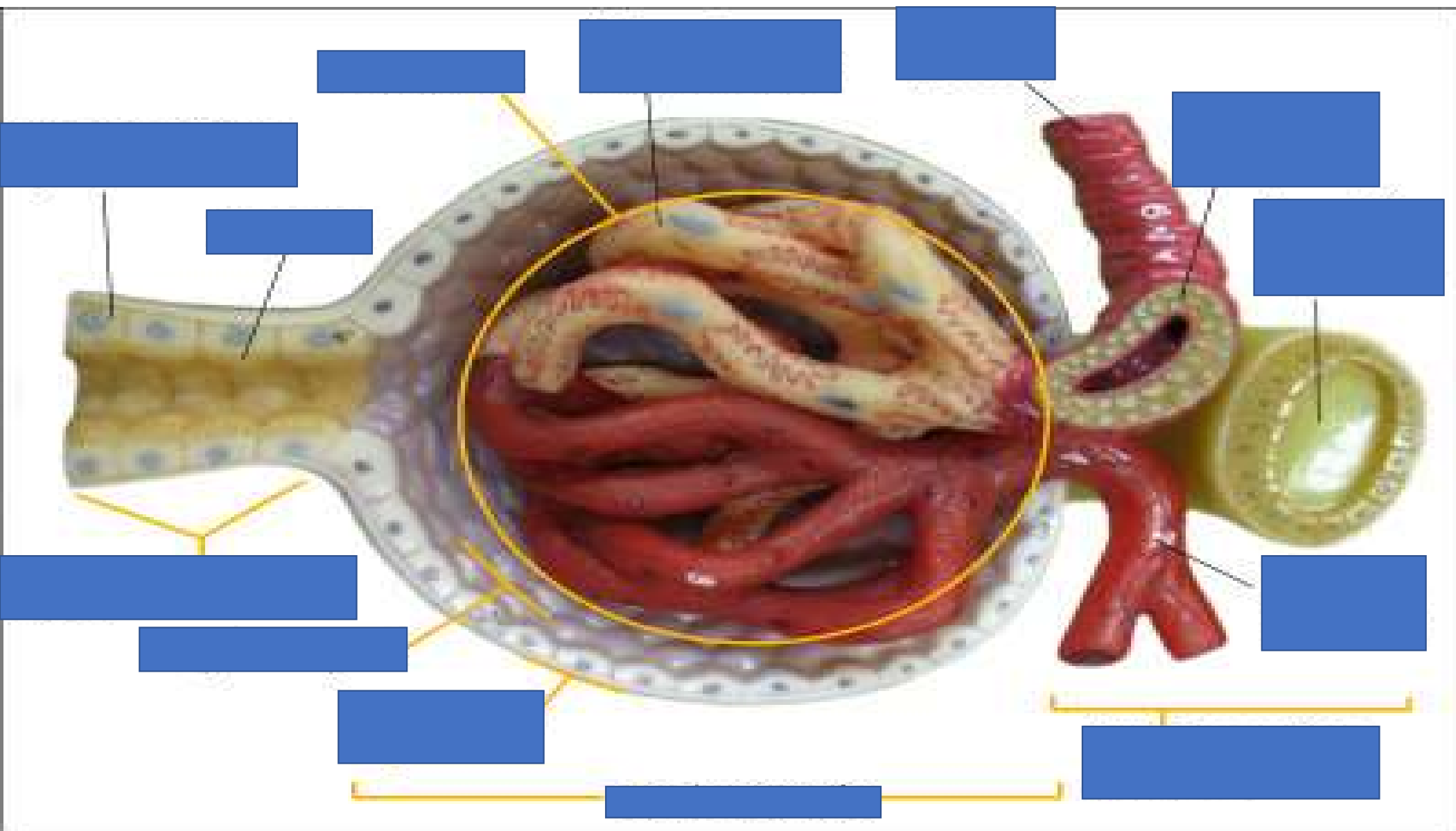
Afferent artery

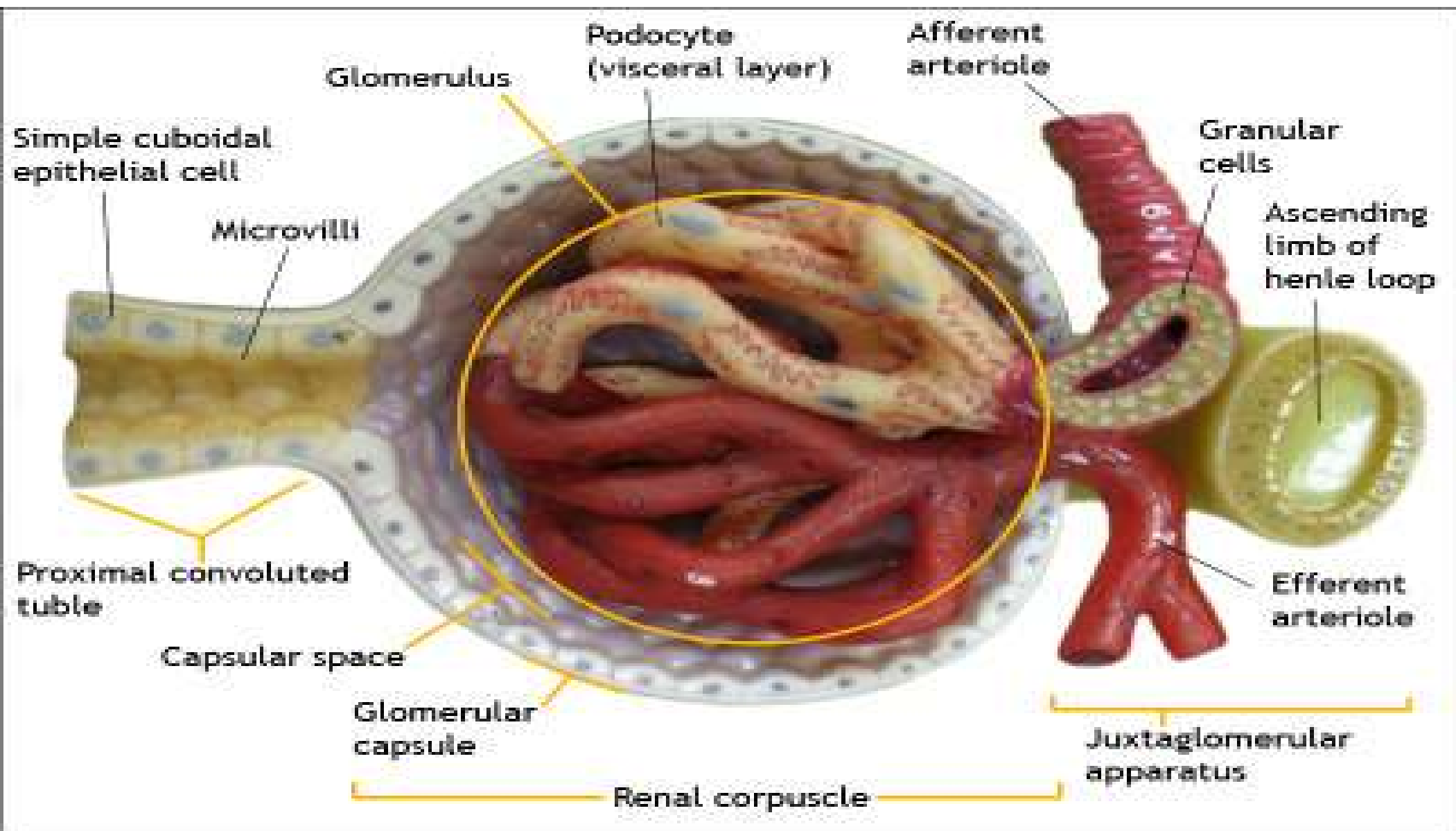
Distal tubule

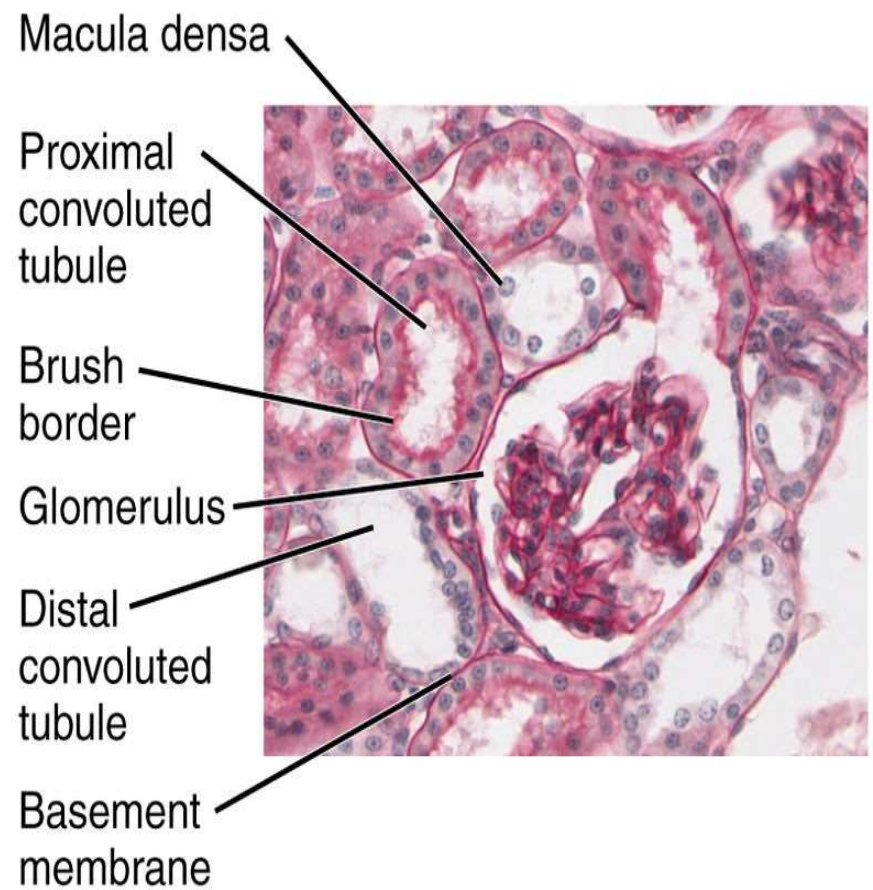
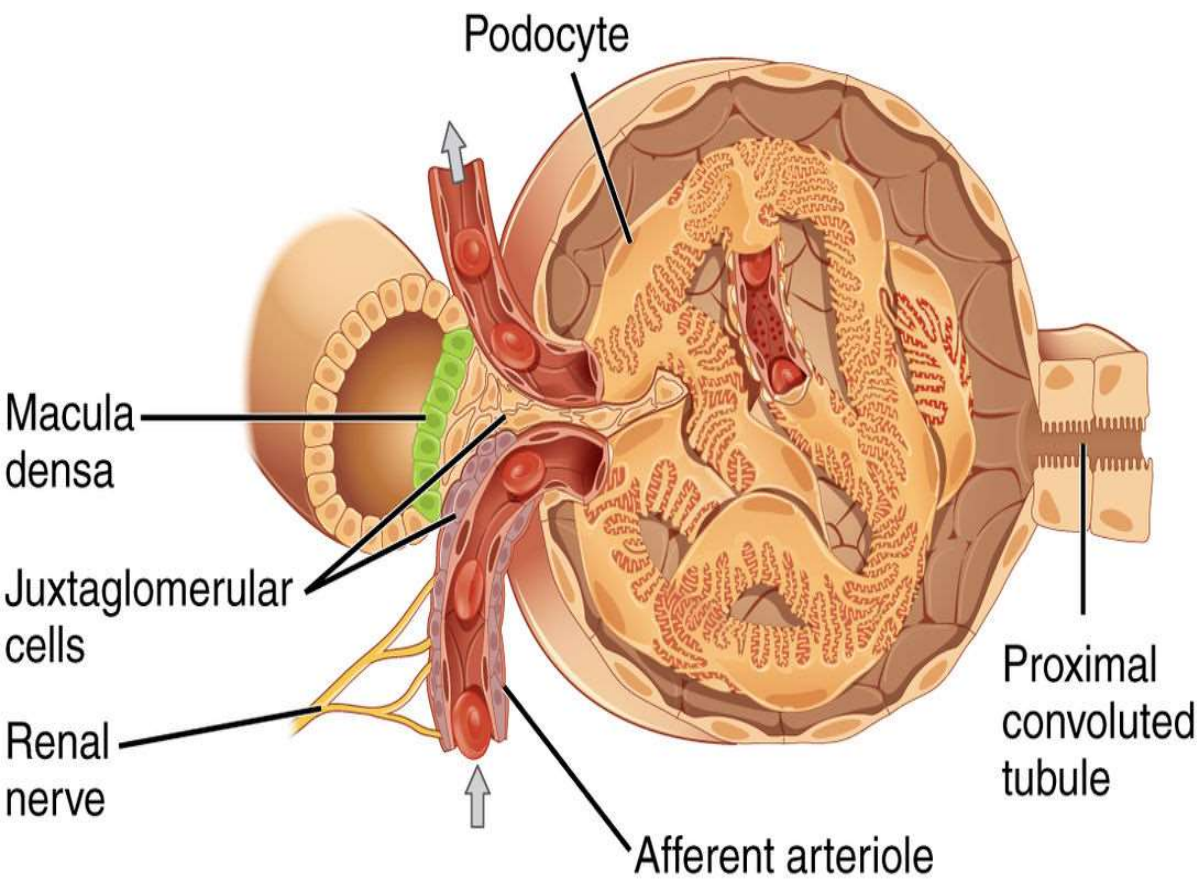
Macula densa

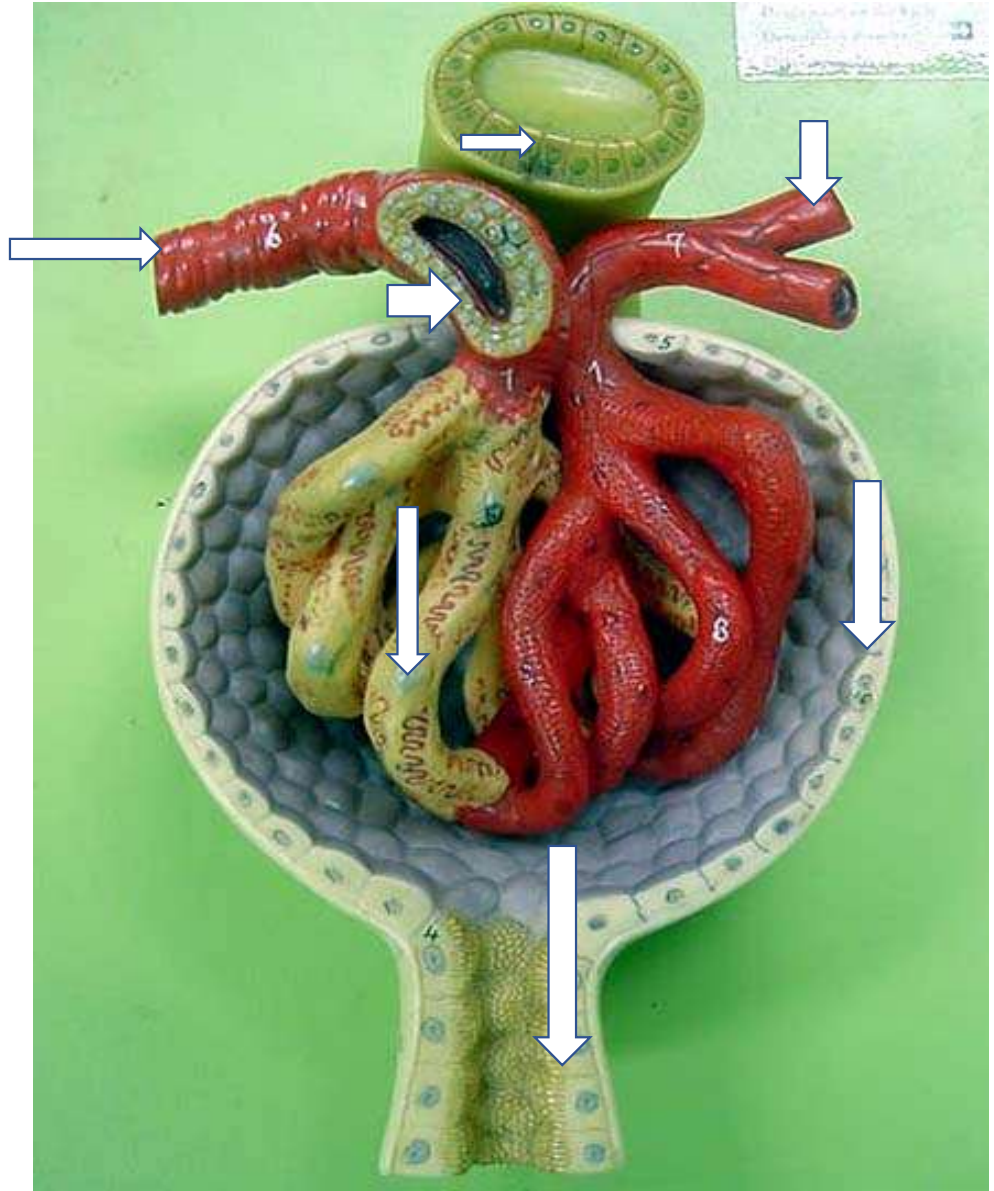
Efferent artery

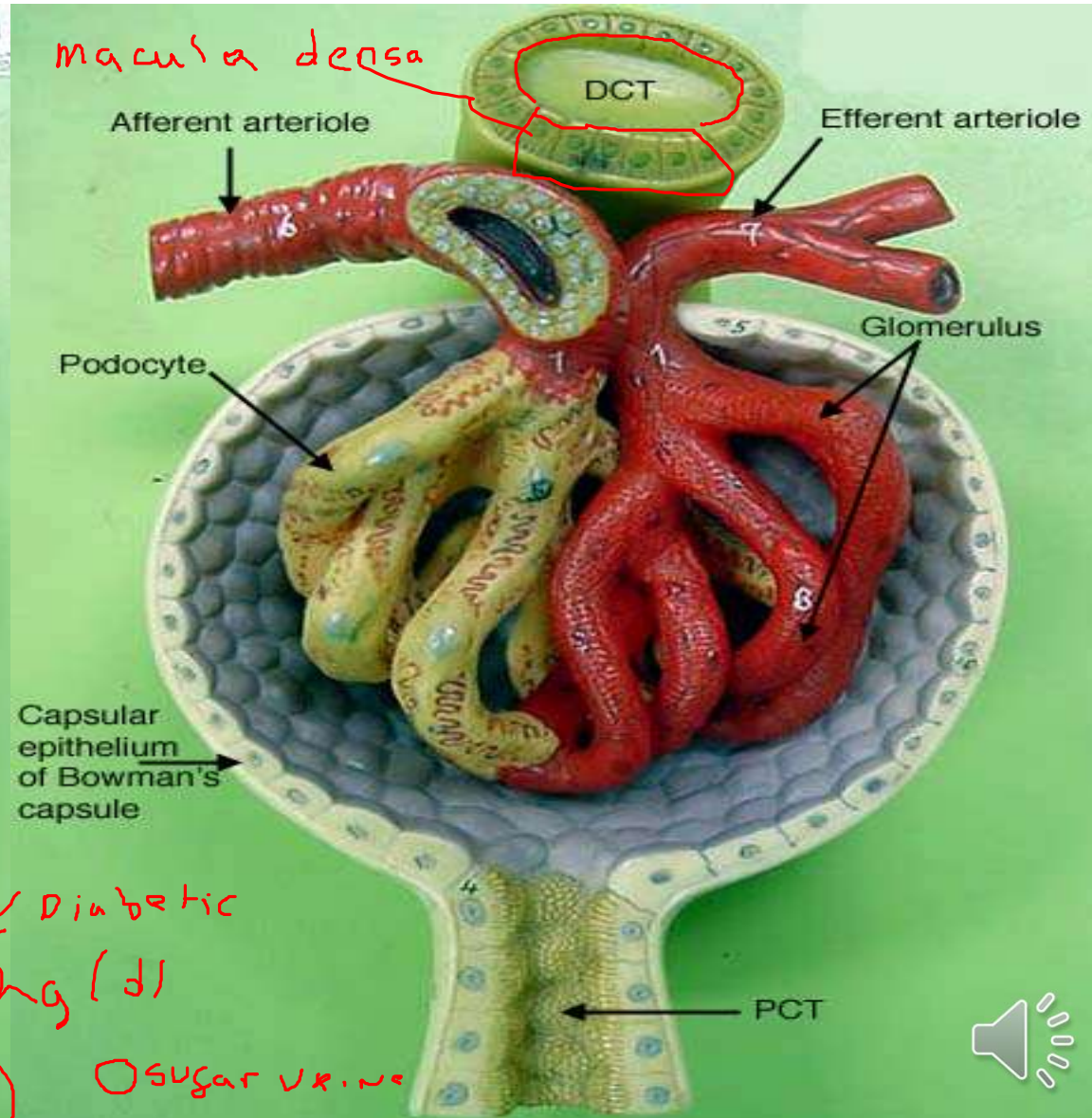












Diabetic
18mg/dl
1mg
Sugar urine

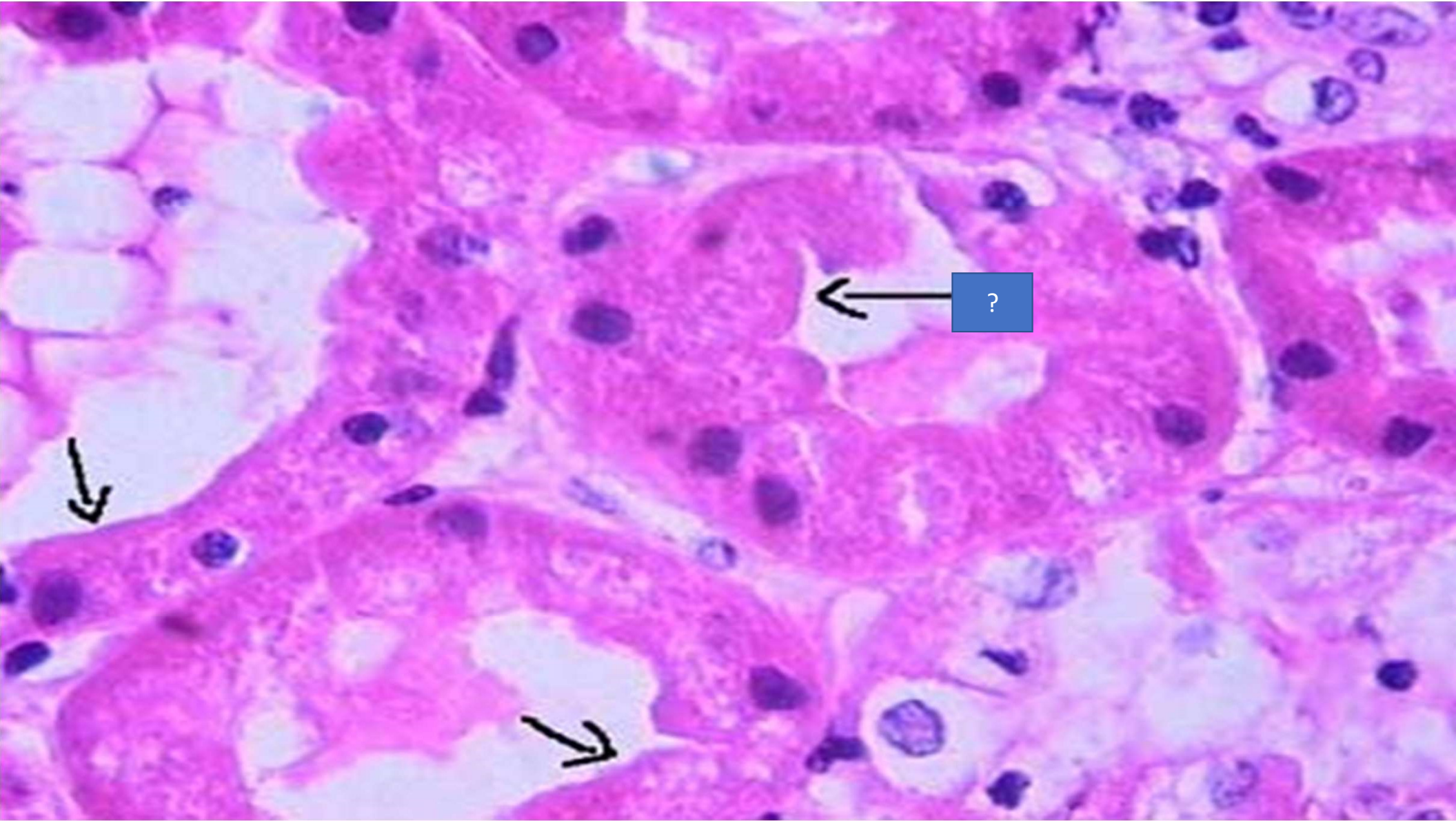


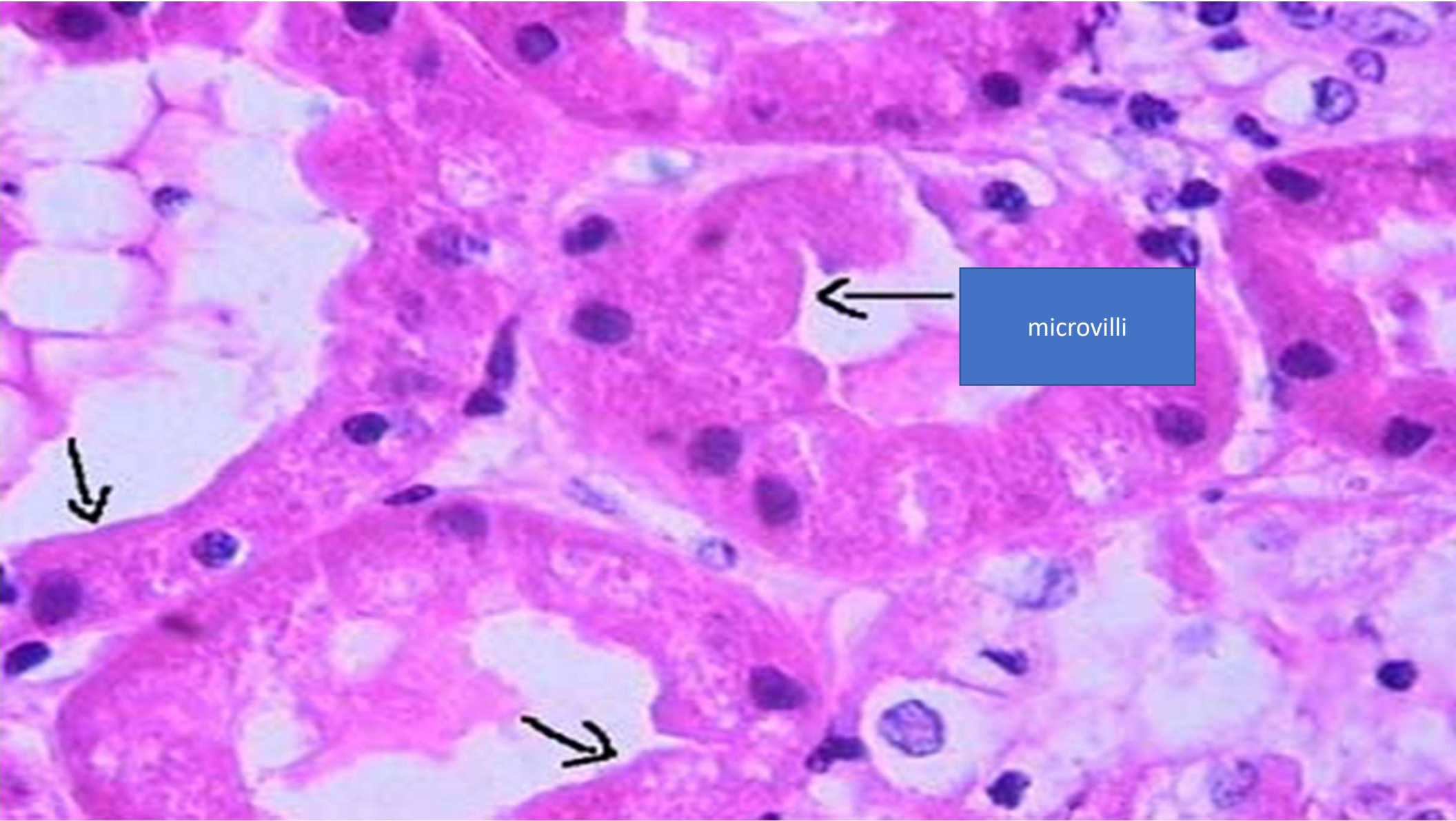
Cortex or medulla?



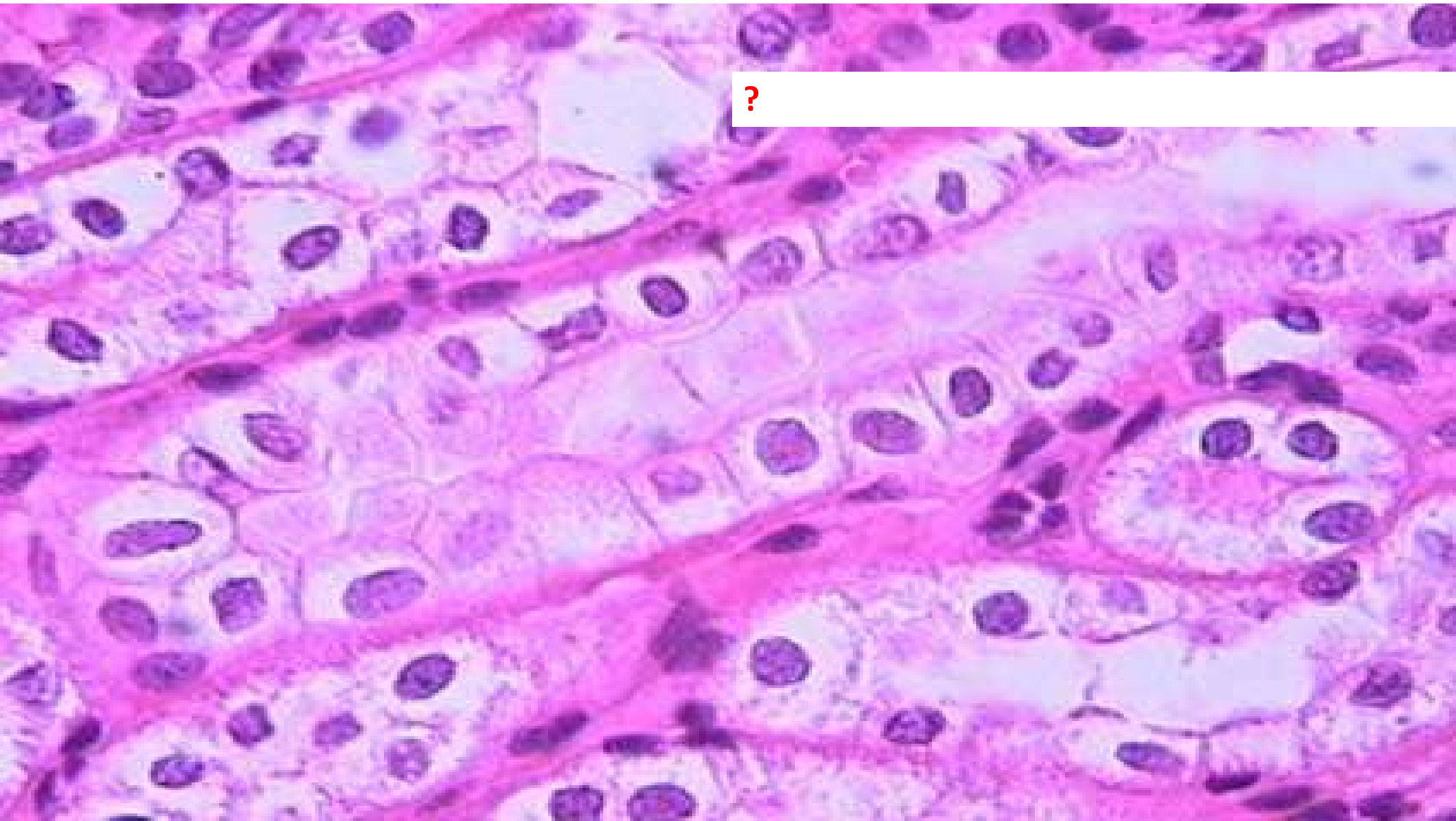
Cortex

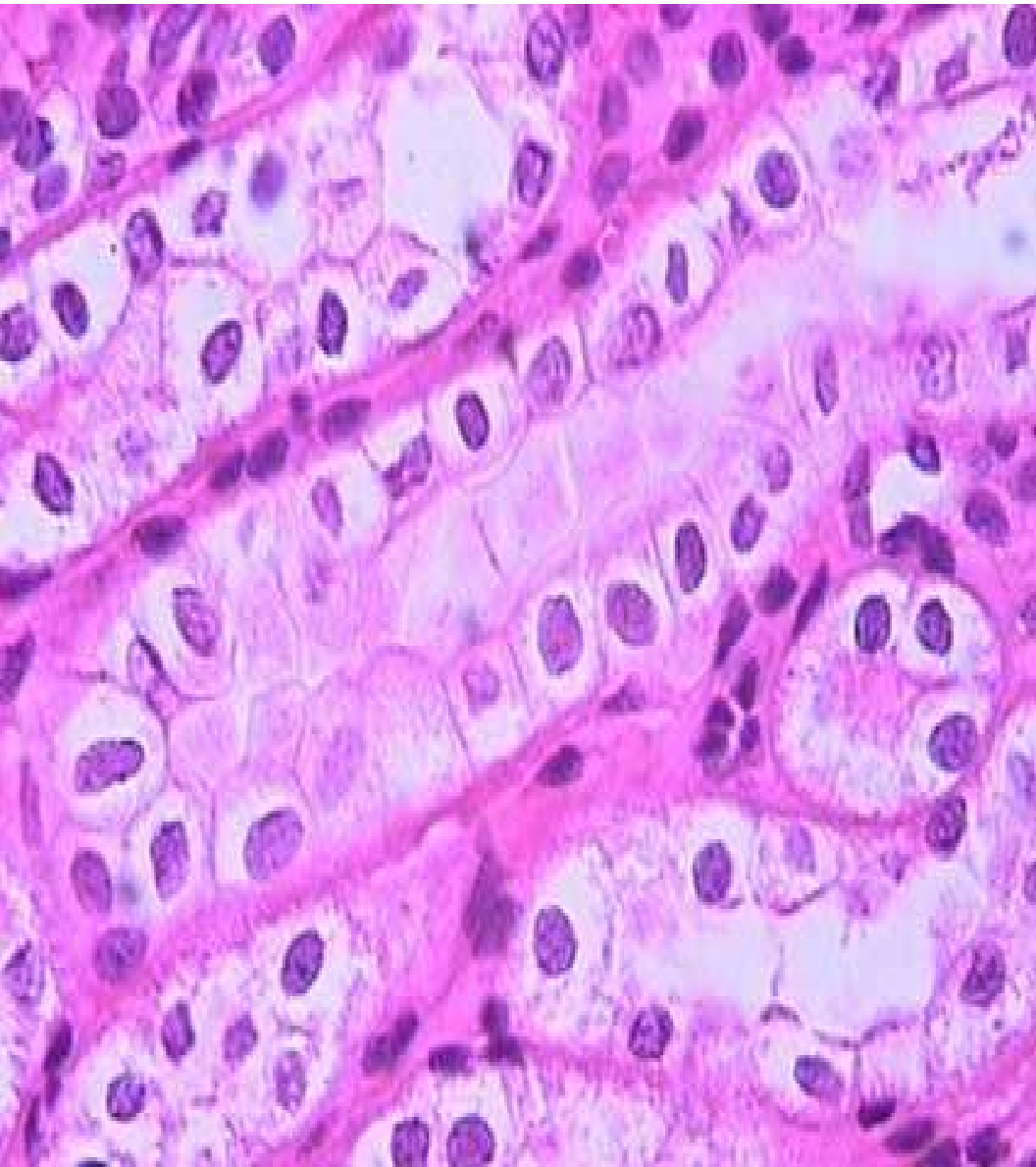






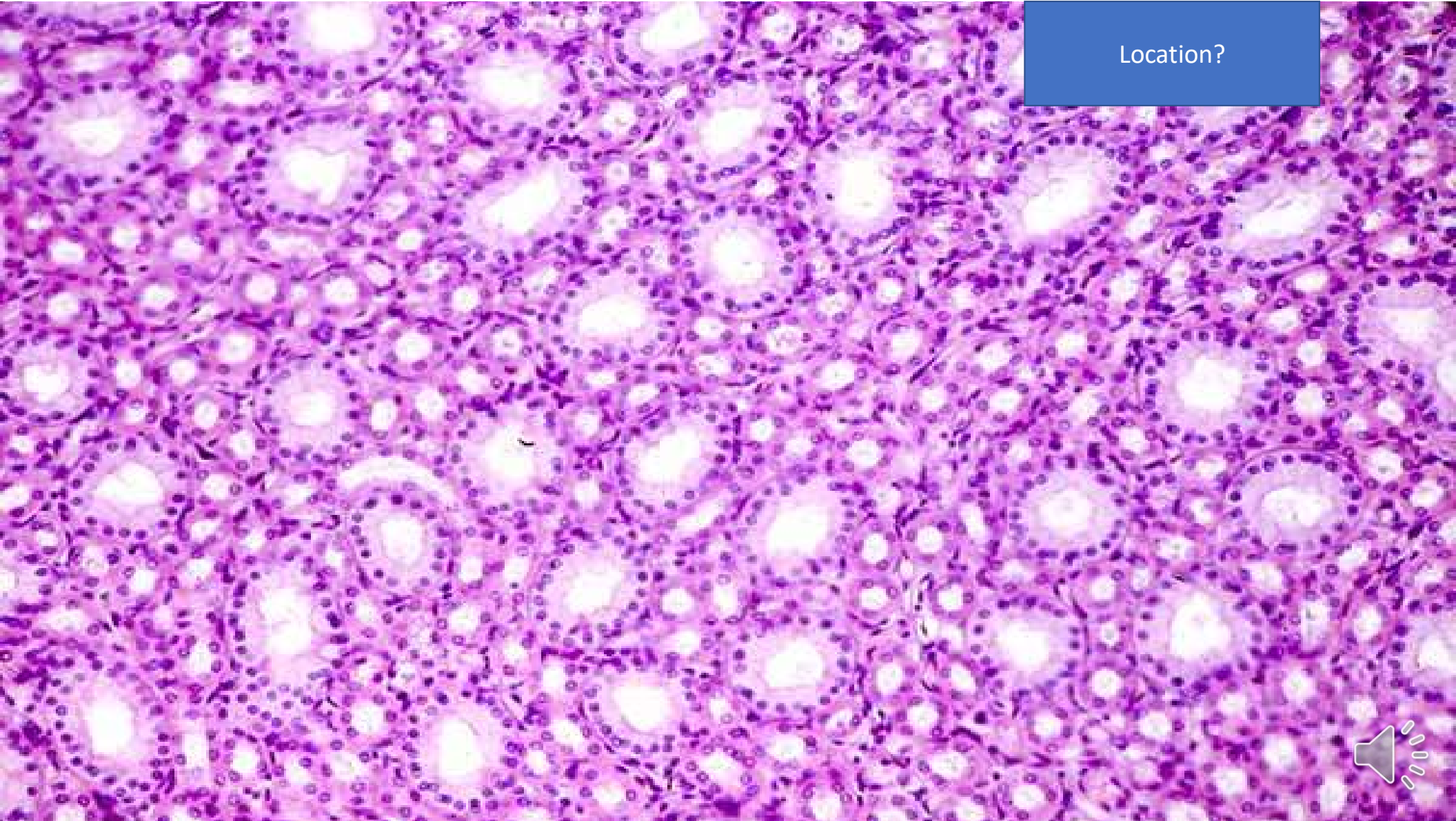
microvilli





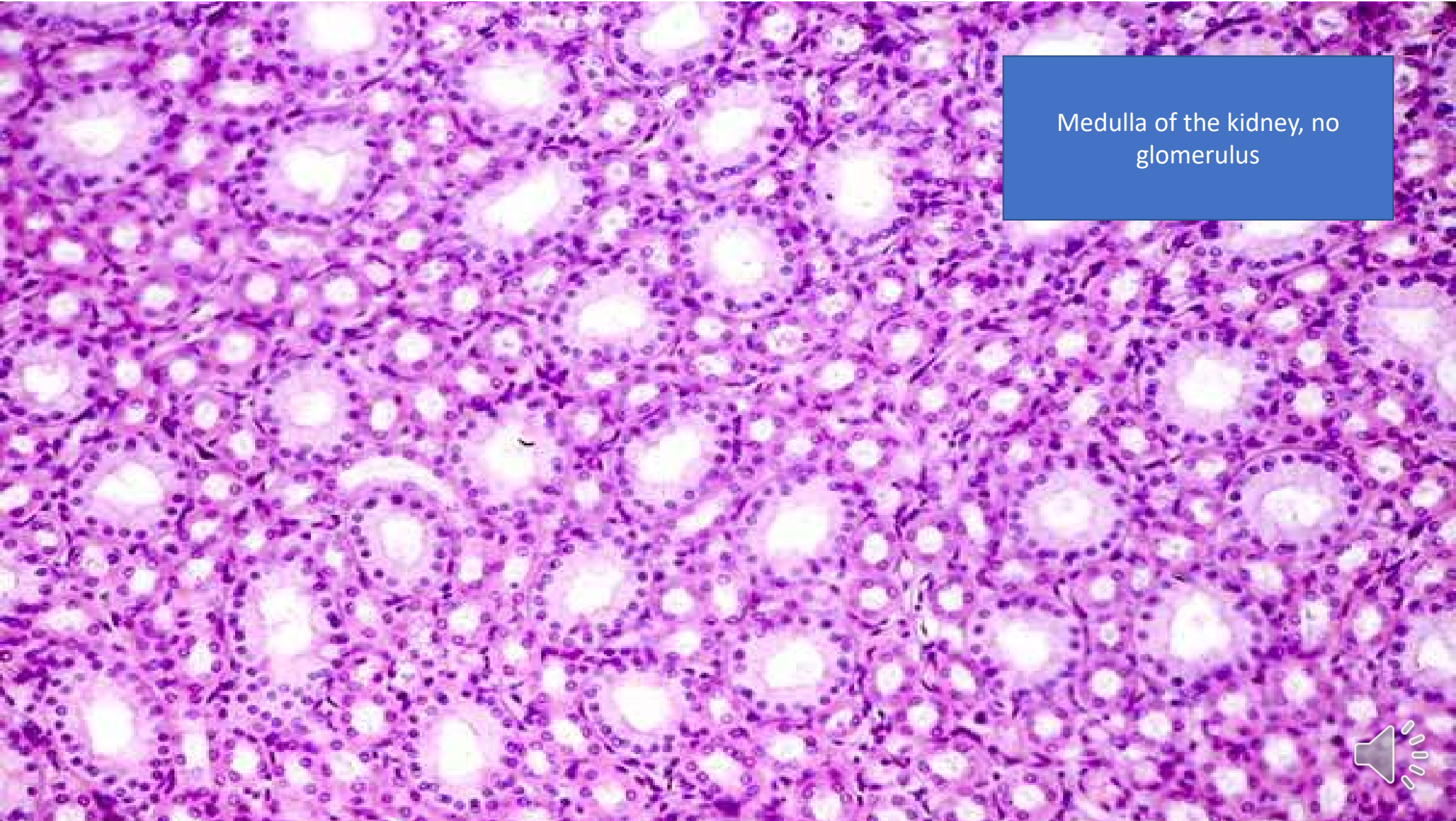
collecting duct cells.

Distal tubule cells gradually change to collecting duct cells and the histologic aspect, in many cases, do not permit differentiate between cells of this portions of the nephron with light microscopy. (H&E, X400).



Location?

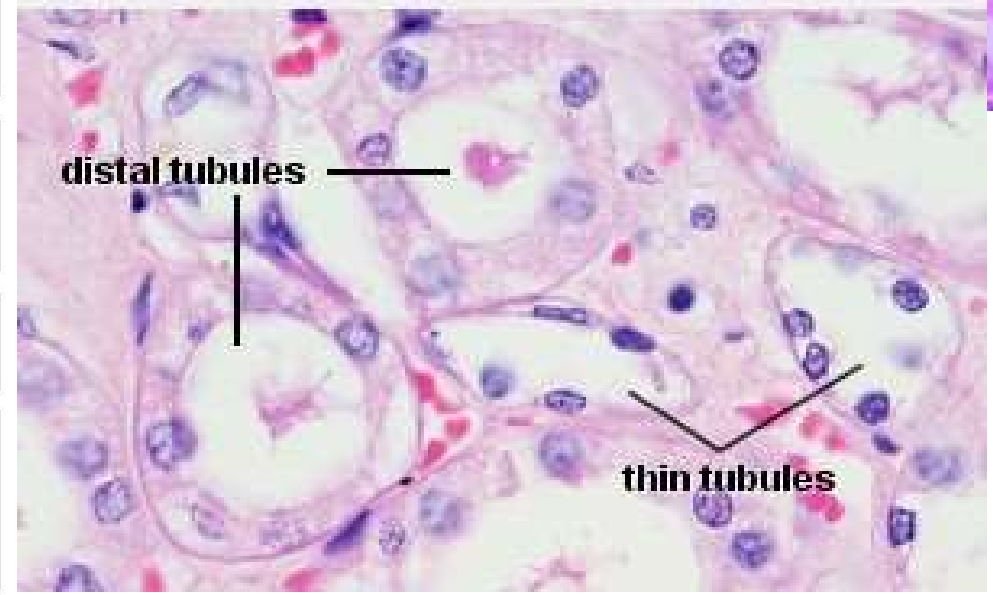
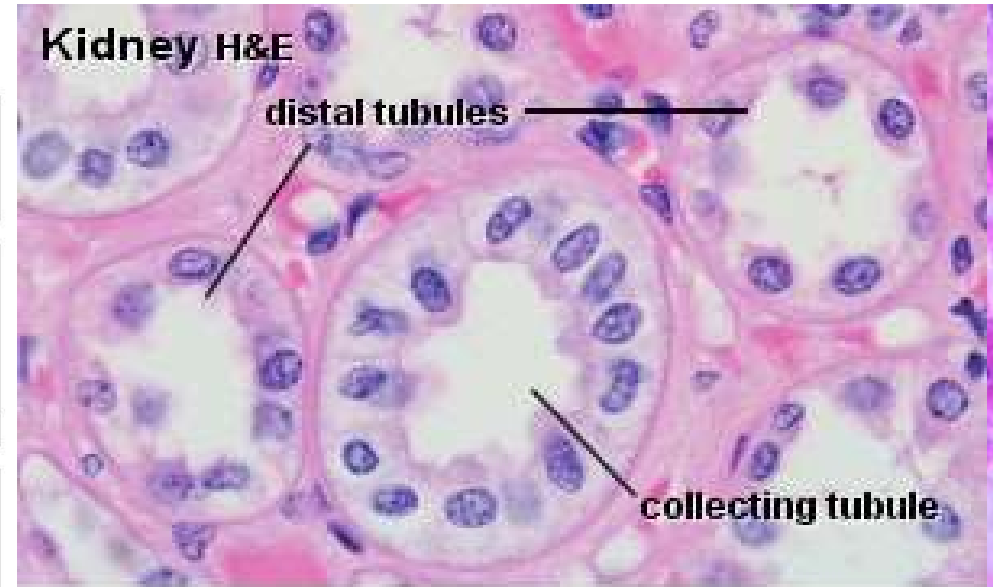
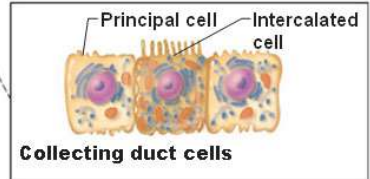
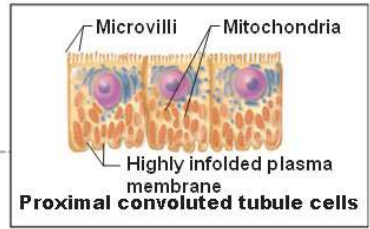
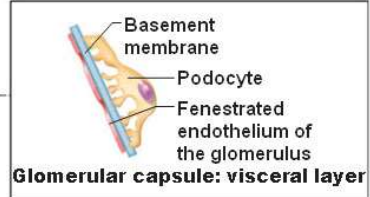
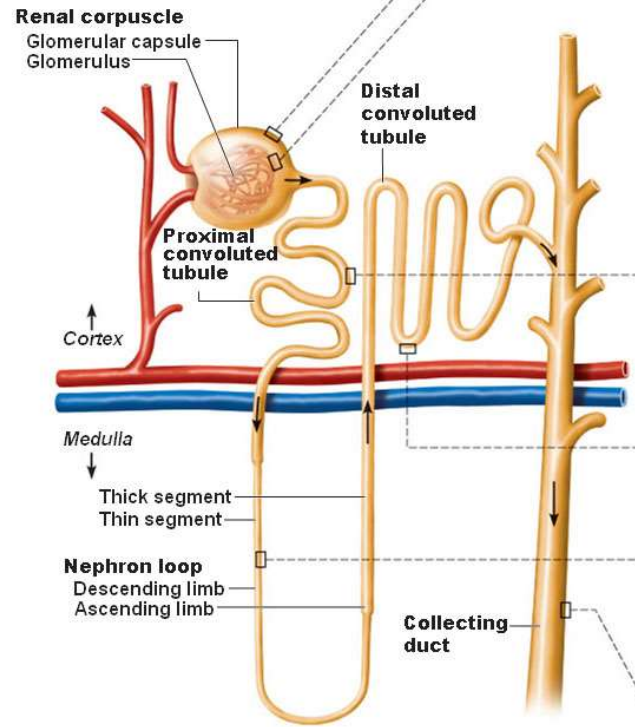
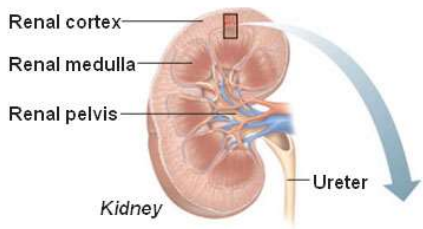




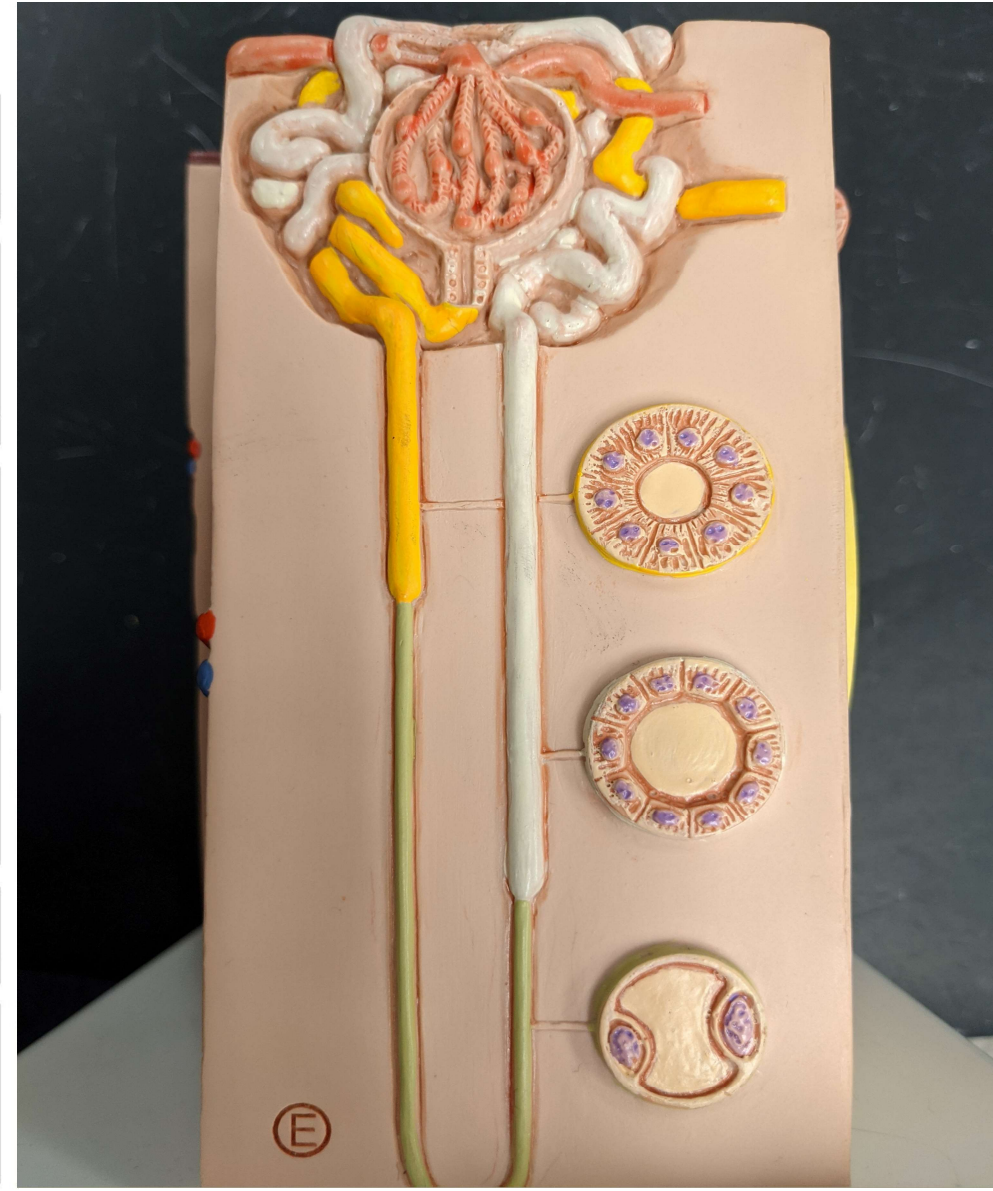
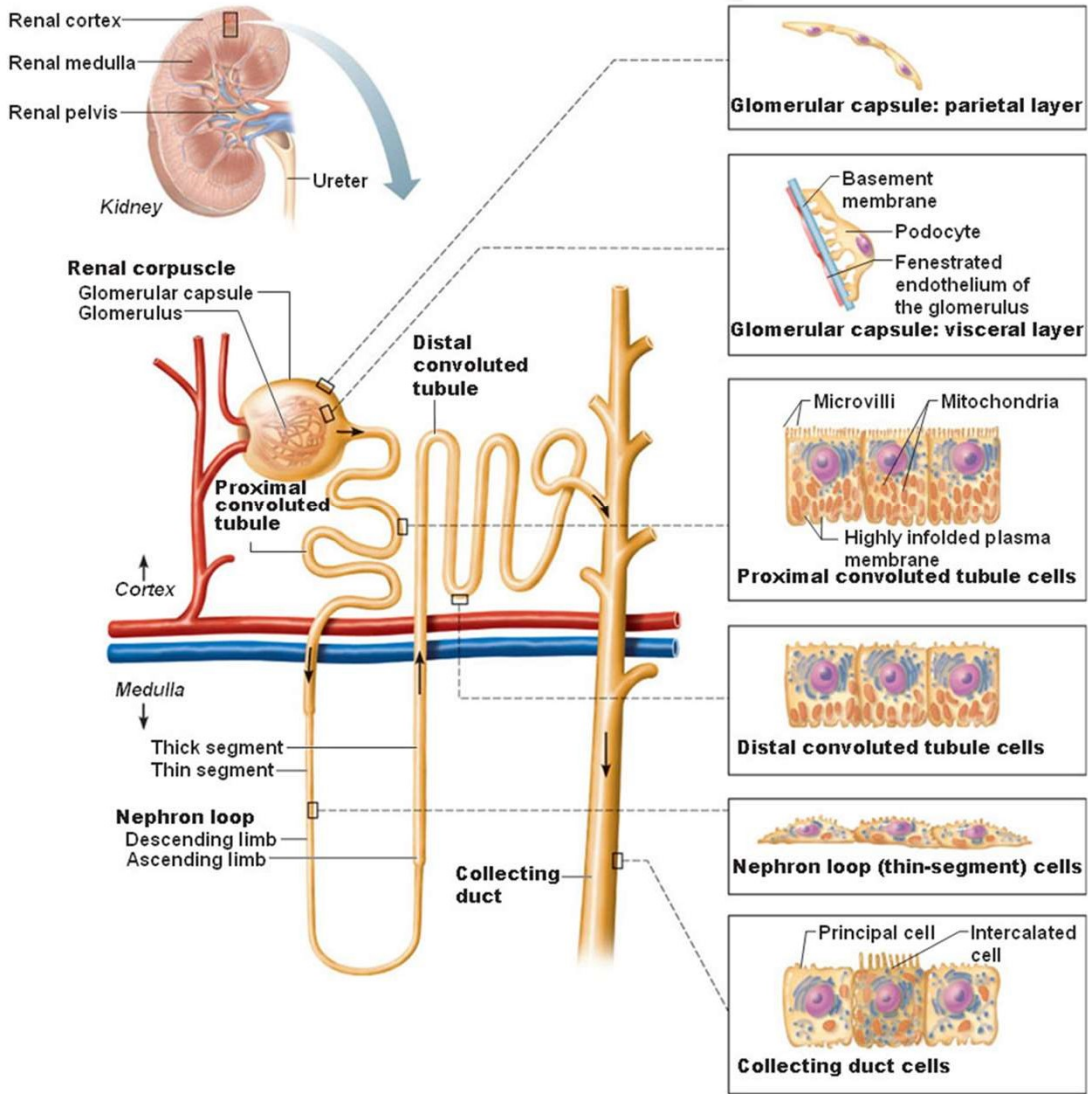
Medulla of the kidney, no glomerulus

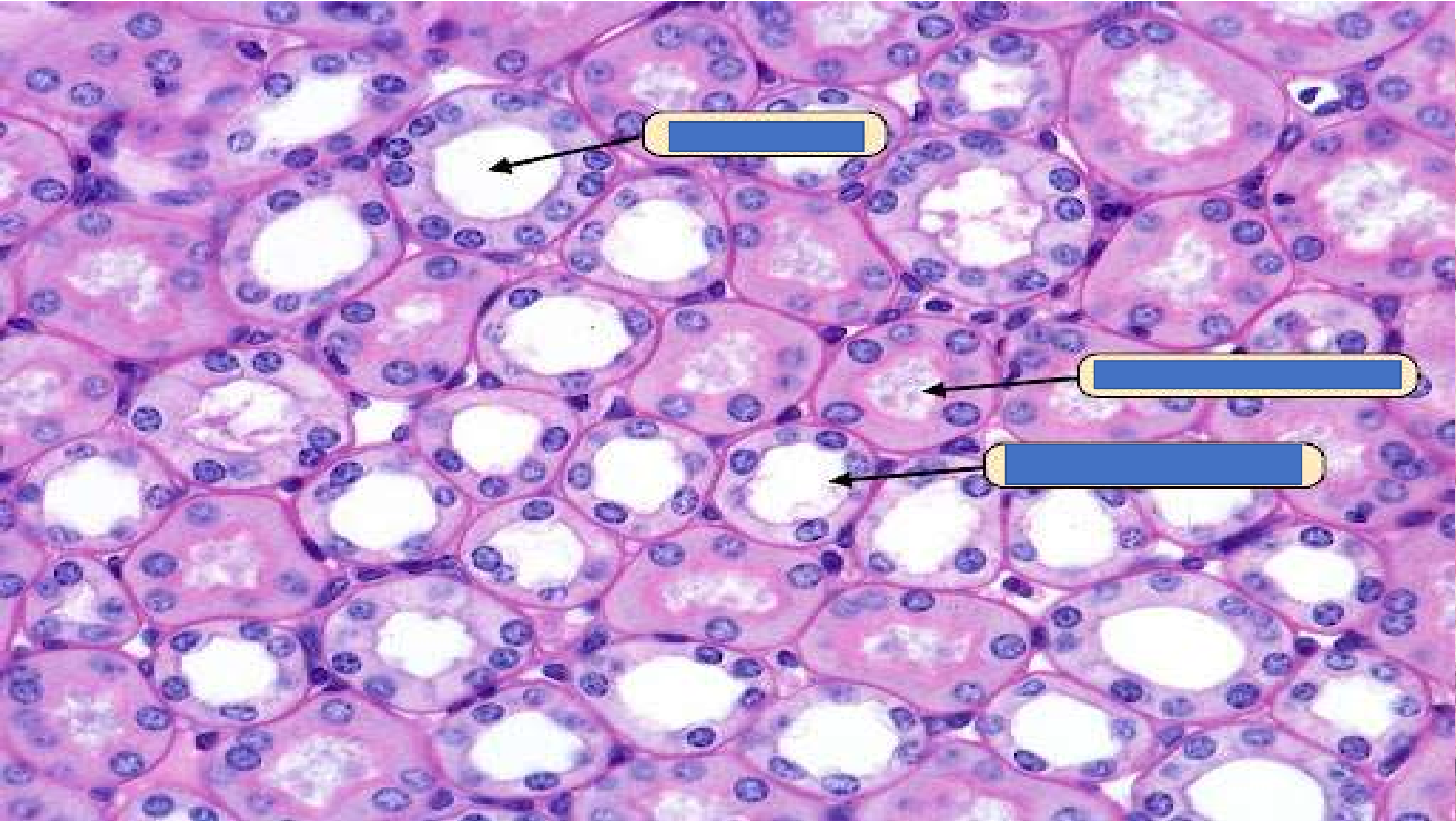


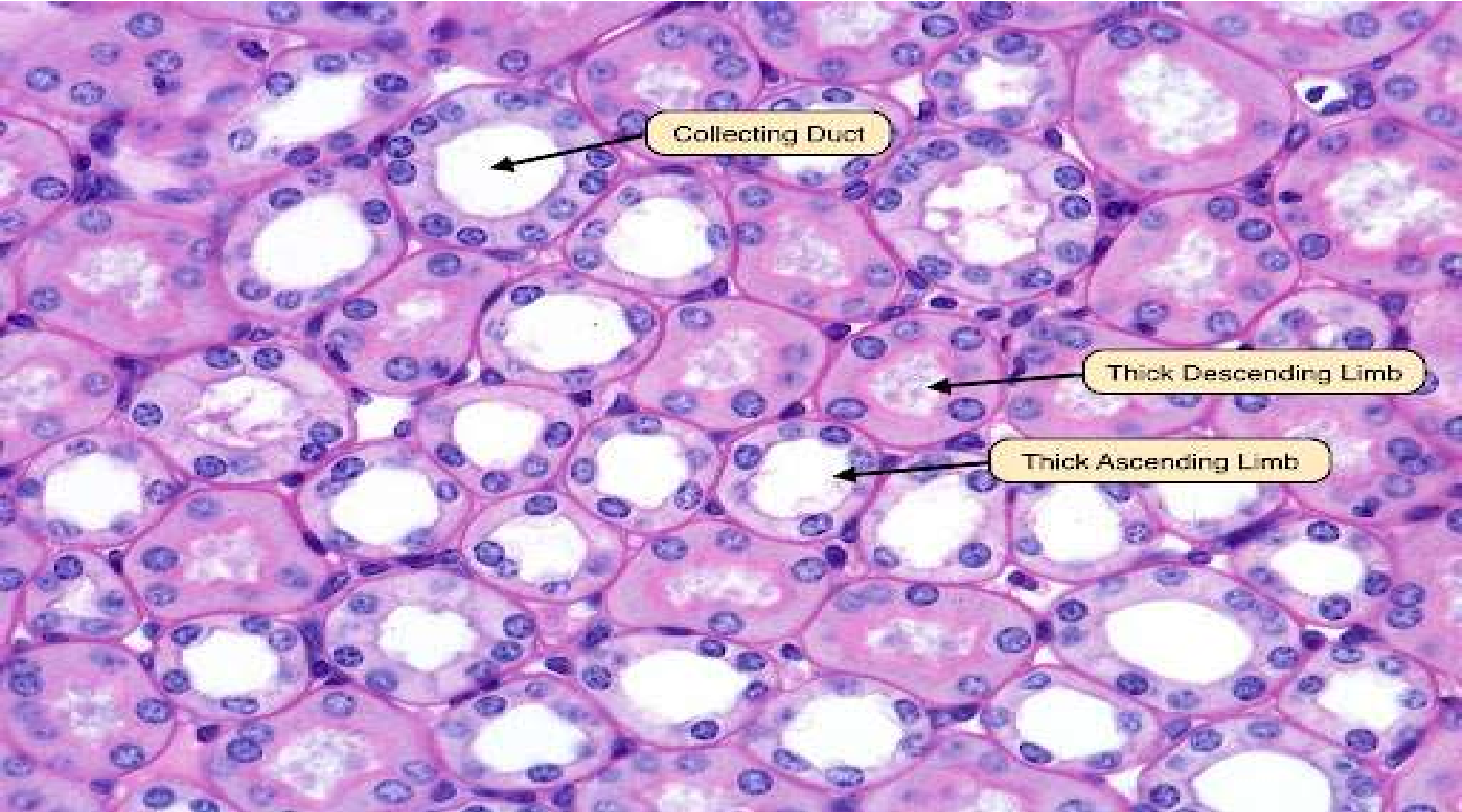
Renal Tubule



Renal Tubule



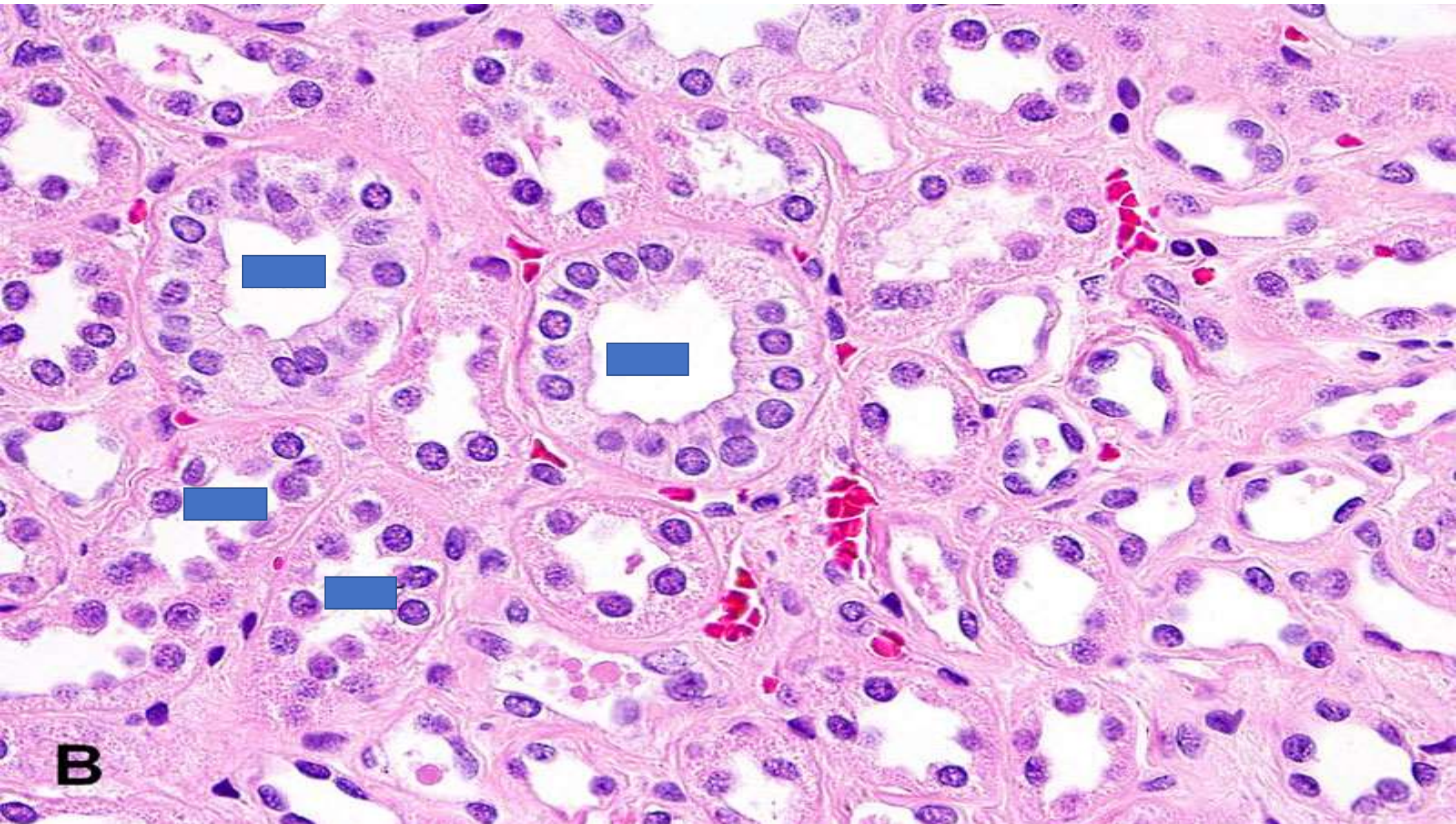


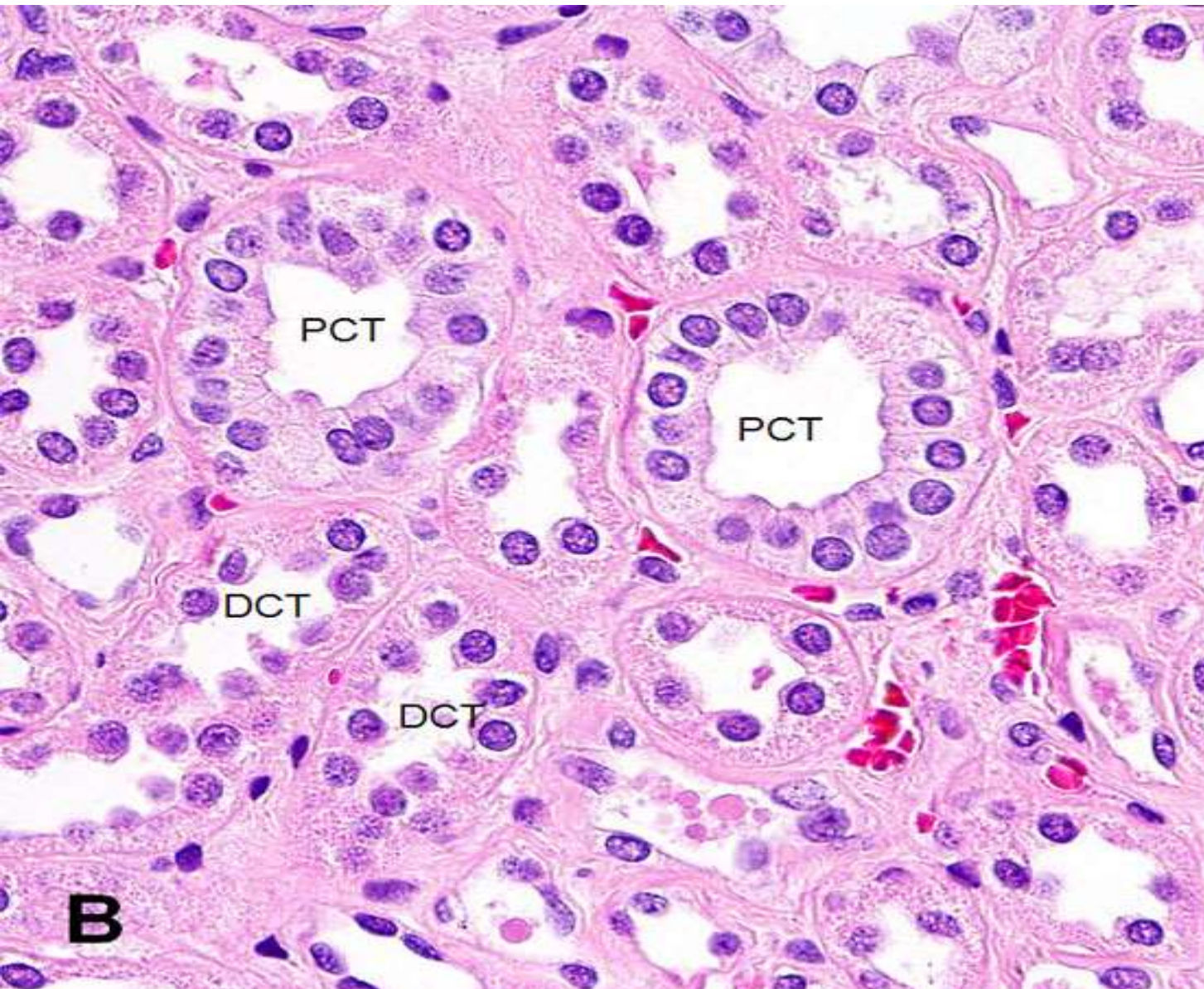


Collecting Duct

Thick Descending Limb

Thick Ascending Limb





Proximal (PCT) and distal (DCT) convoluted tubules
Function to reabsorb ~75% of glomerular filtrate (PCT) and sodium ions from tubular fluid (DCT).

Histology:
PCT has abundant dark-pink cytoplasm (mitochondria) with prominent brush border (increased surface area for reabsorption) (image A) & (image B).

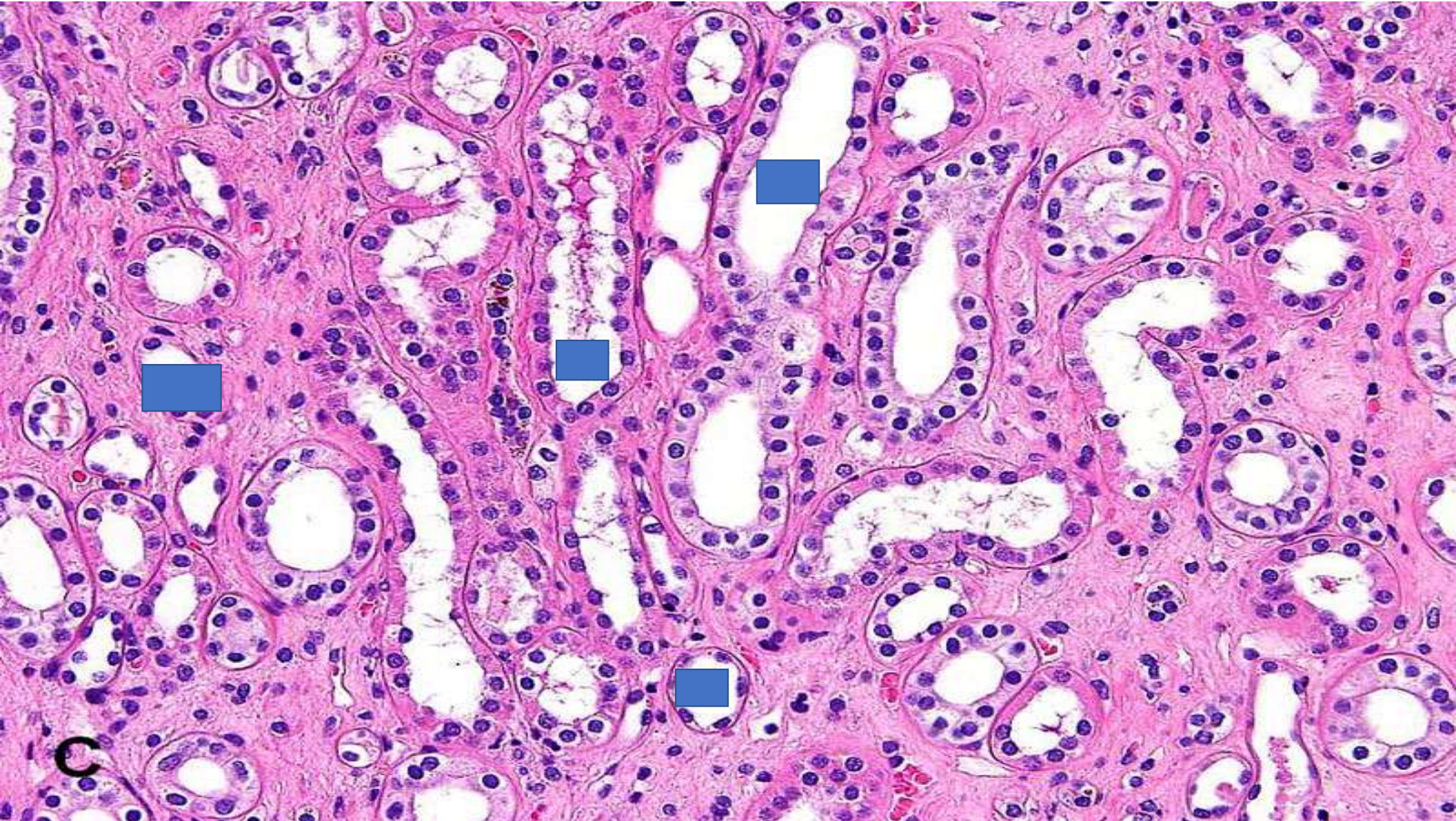
DCT has smaller cells with less cytoplasm, which gives the impression of "more nuclei" in cross-section.

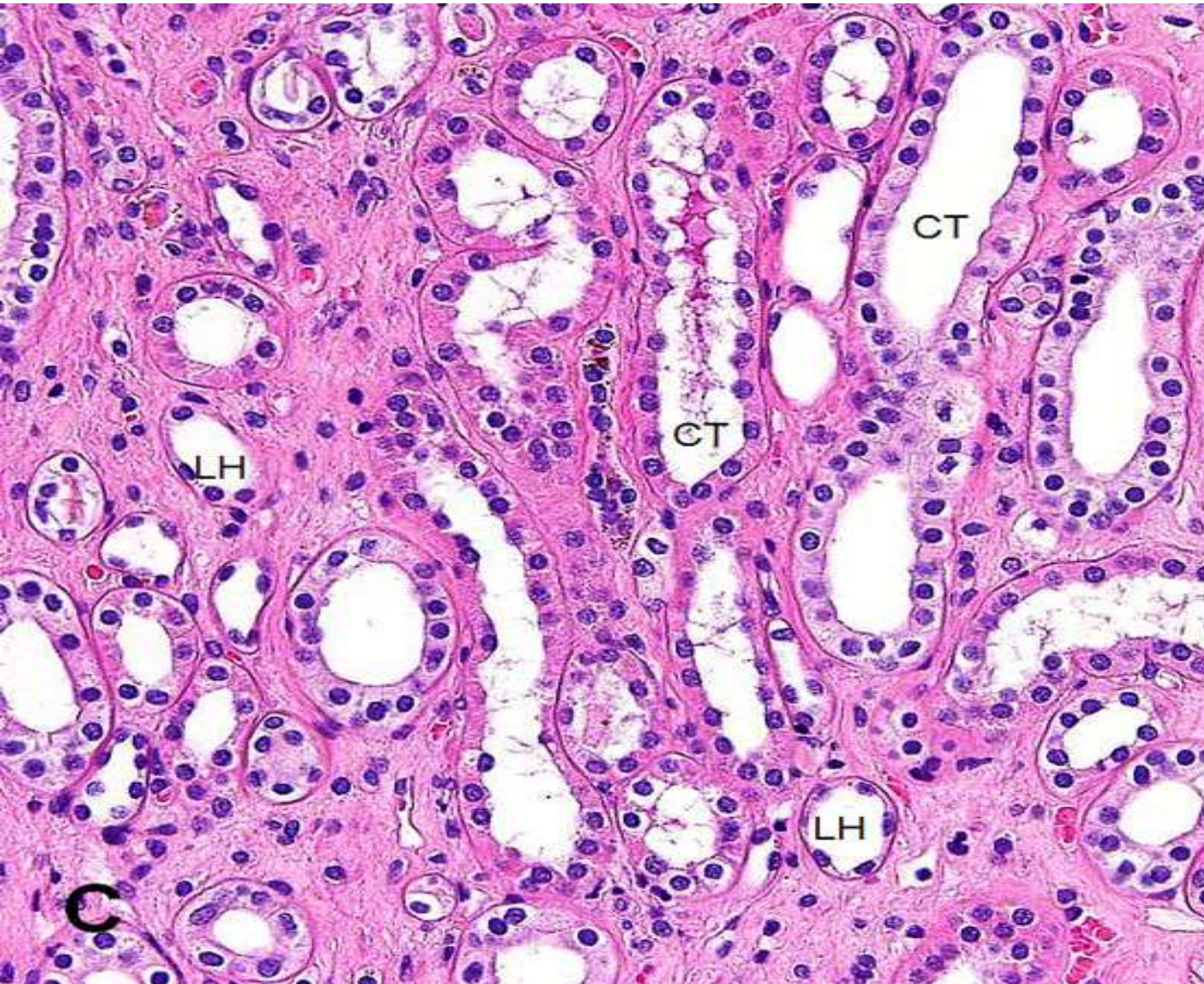
What is the primary function of aldosterone acting on the distal convoluted tubule?

What is the primary function of parathyroid hormone (PTH) acting on the distal convoluted tubule?

Sodium reabsorption

Calcium reabsorption





Loop of Henle (LH)

Produces increasing osmotic gradient from cortex to deepest medulla.

Thin descending limb: simple squamous epithelium .

Thick ascending limb: low cuboidal epithelium.

Collecting tubules (CT)

No active reabsorptive function.

Form medullary rays of kidney.

Cuboidal epithelium without brush border.

Collecting ducts (CD)

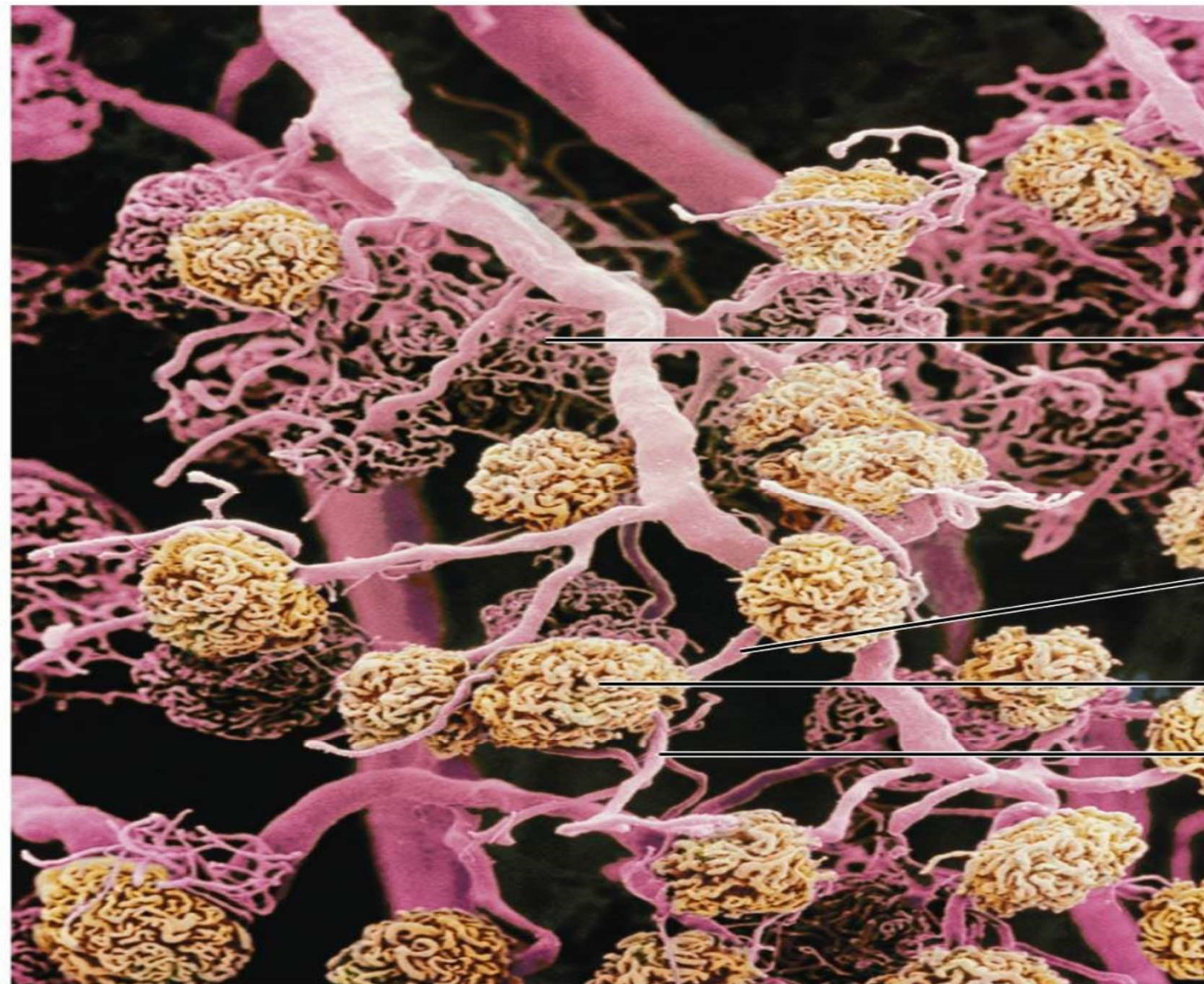
Convey urine to the pelvicaliceal space.

No active reabsorption unless ADH is present (then cells become permeable to water which is passively reabsorbed).

Tall columnar cells with well-defined cellular outlines (largest form the Ducts of Bellini)

Active transport of substances from the blood into the nephron is called:

Tubular secretion

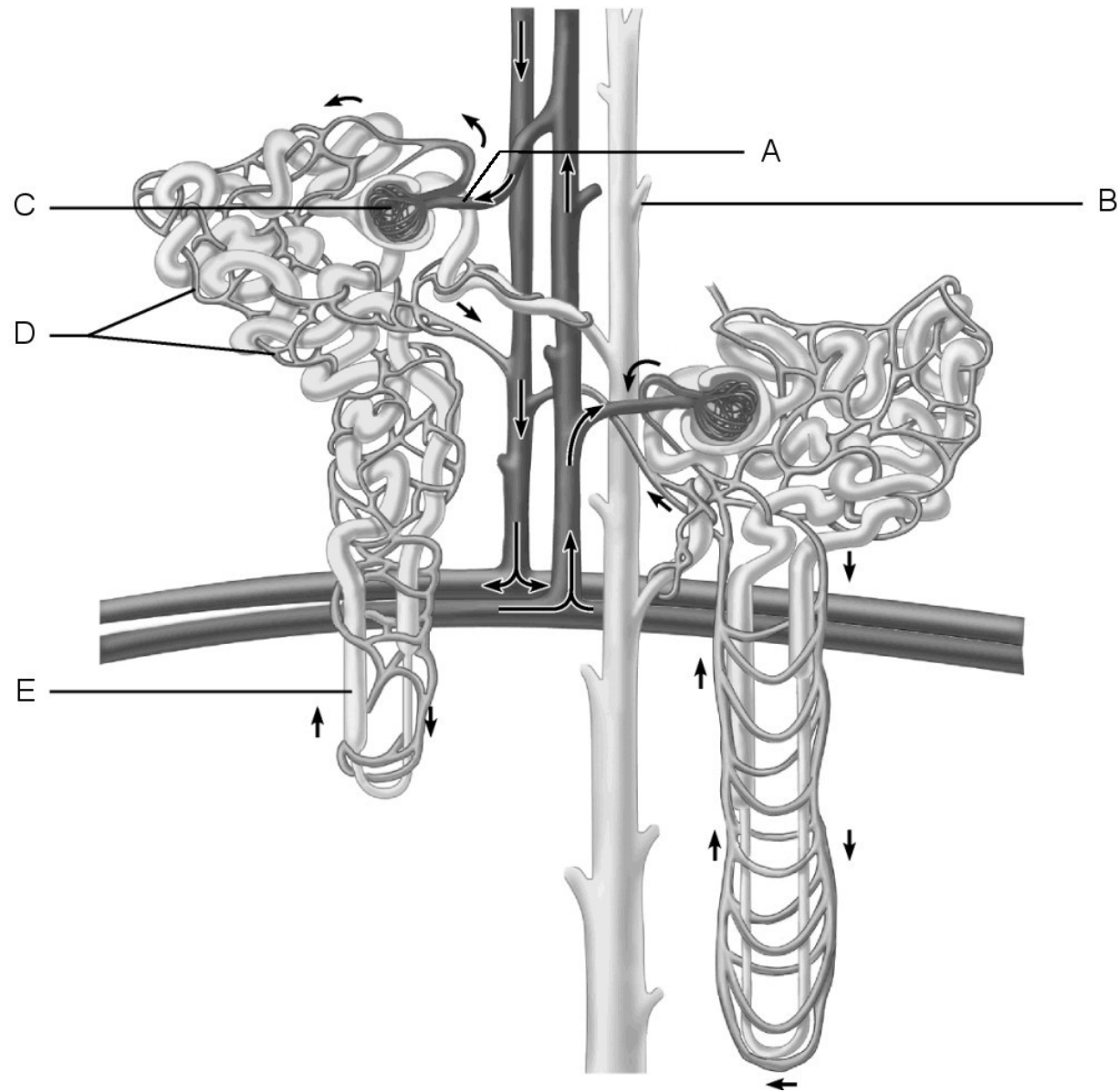


**Peritubular
capillary bed**

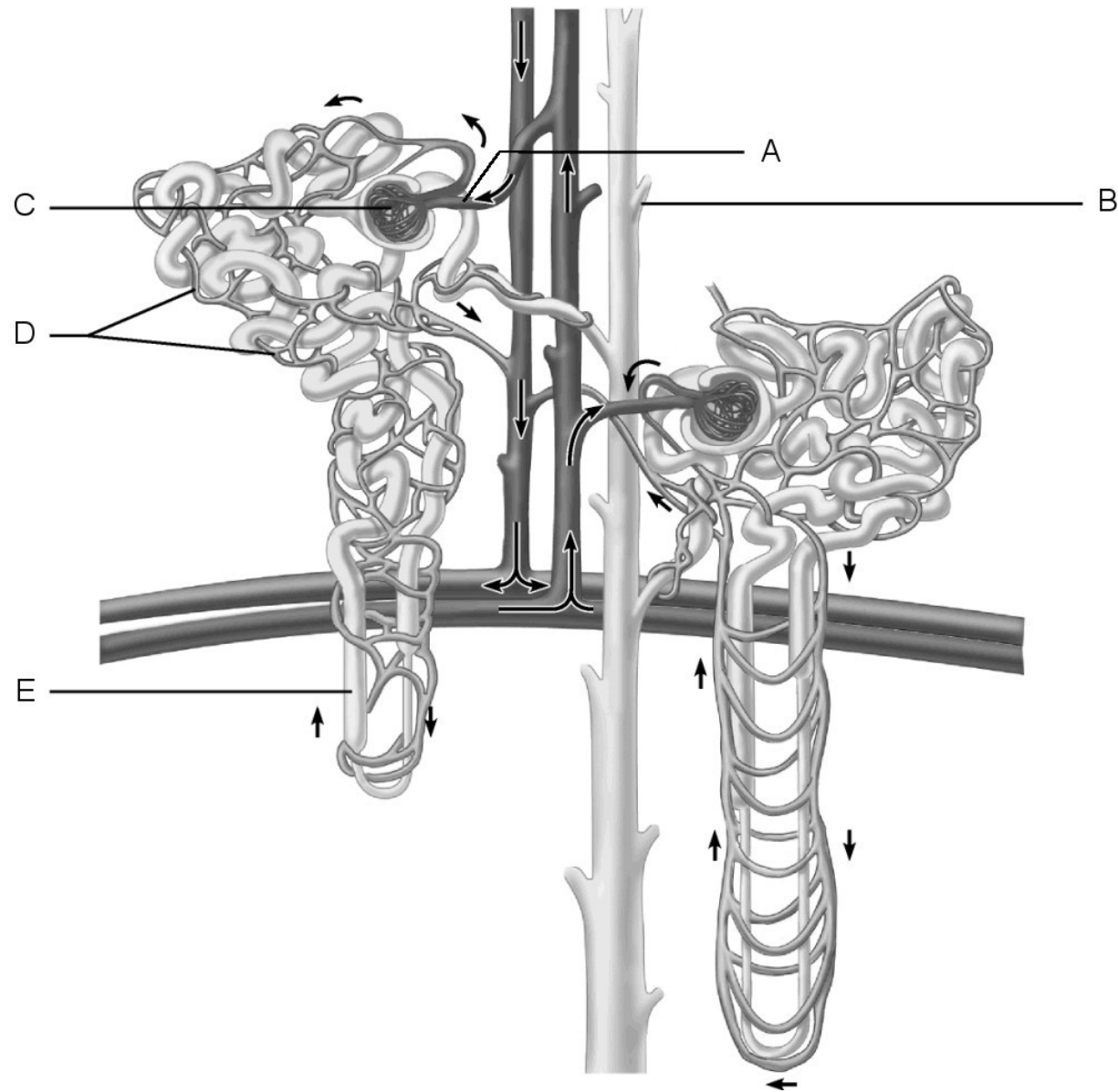
**Afferent
arteriole**

Glomerulus

**Efferent
arteriole**



- 18) Glomerulus.**
- 19) Afferent arteriole.**
- 20) Collecting duct.**
- 21) Loop of Henle.**
- 22) Peritubular capillaries.**



18) Glomerulus.

Answer: C

19) Afferent arteriole.

Answer: A

20) Collecting duct.

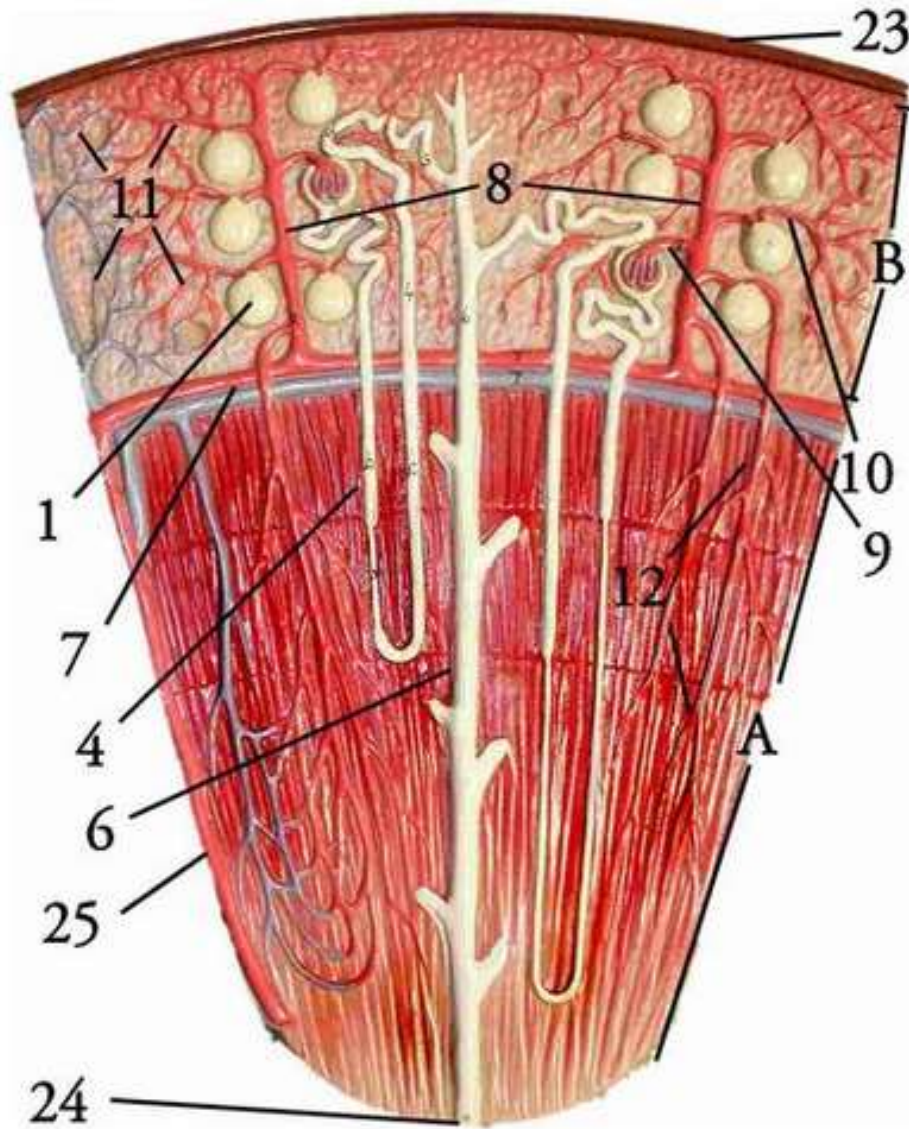
Answer: B

21) Loop of Henle.

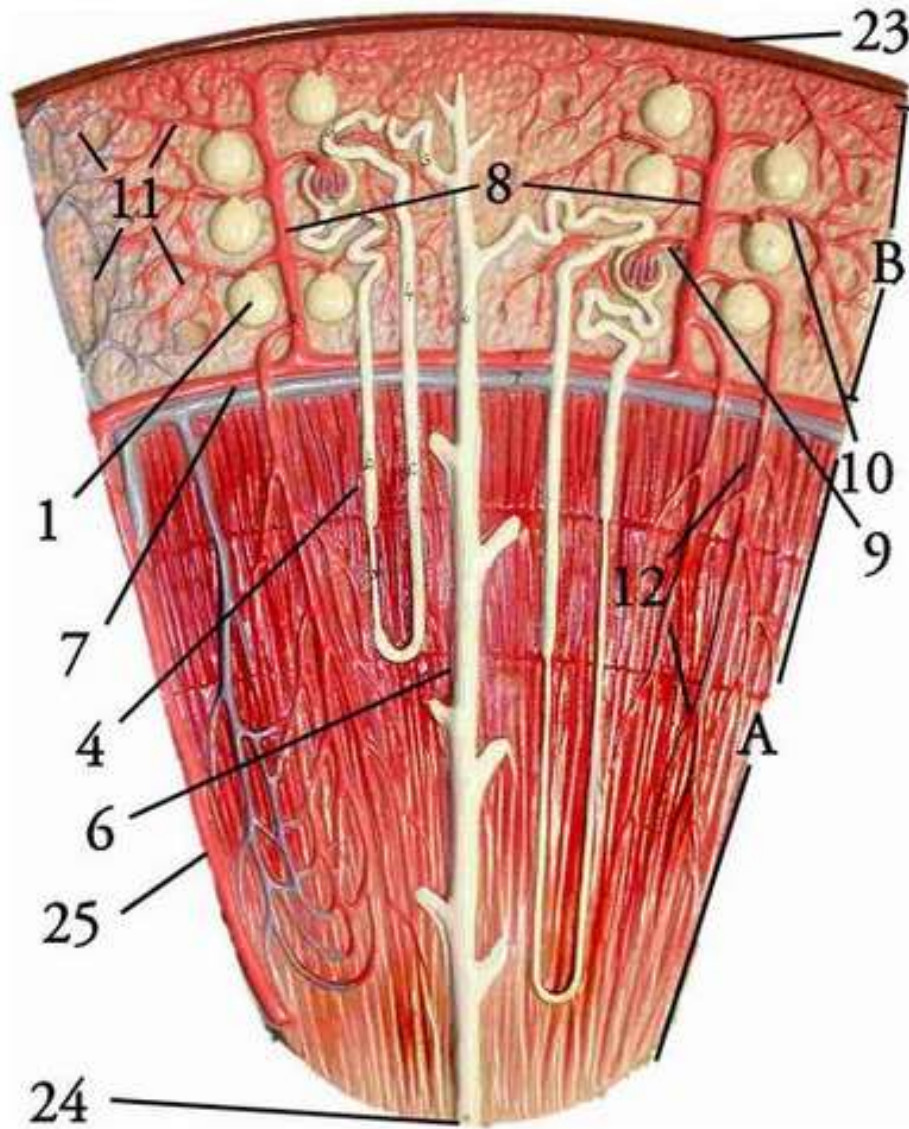
Answer: E

22) Peritubular capillaries.

Answer: D



9
#10

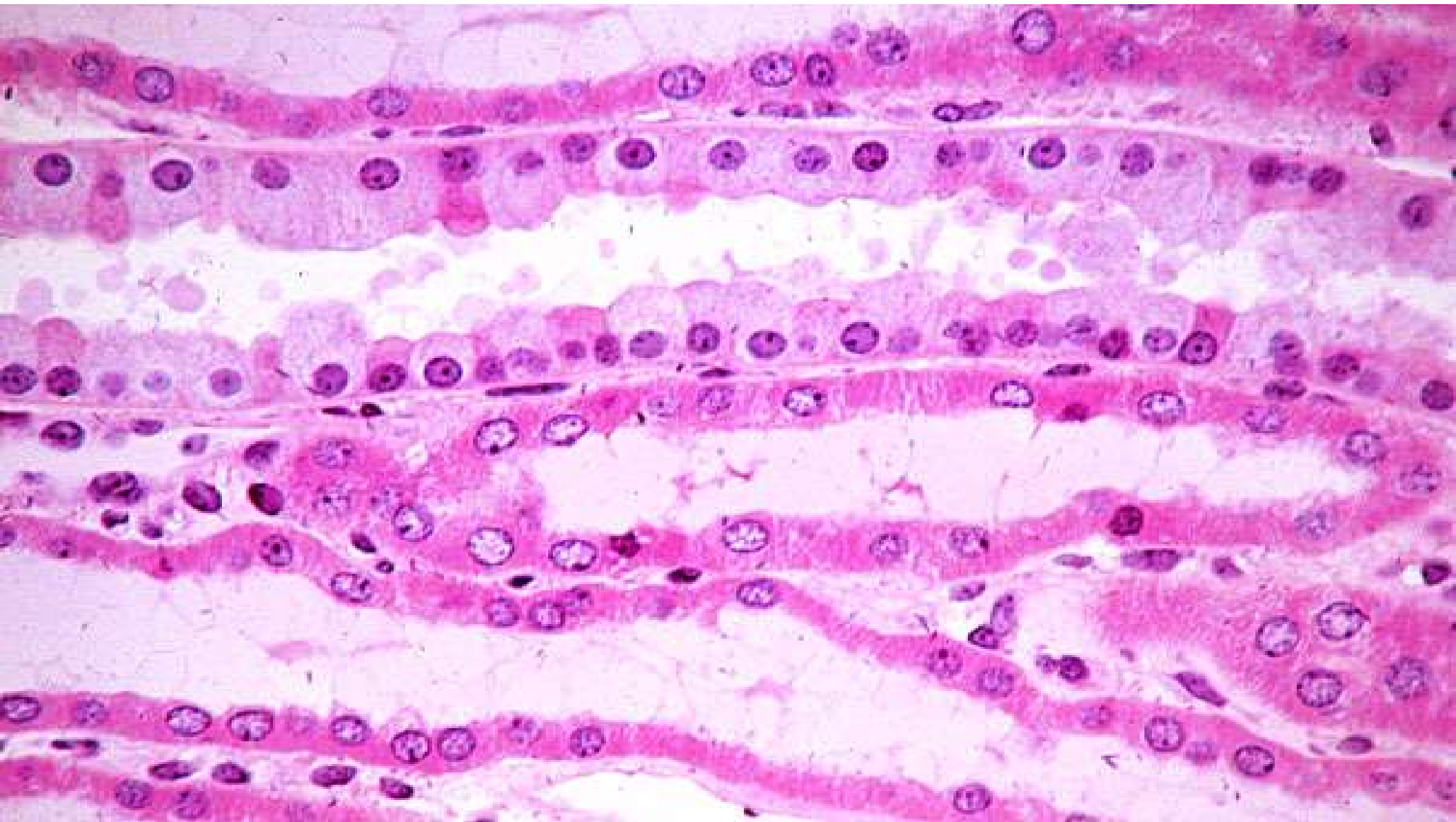


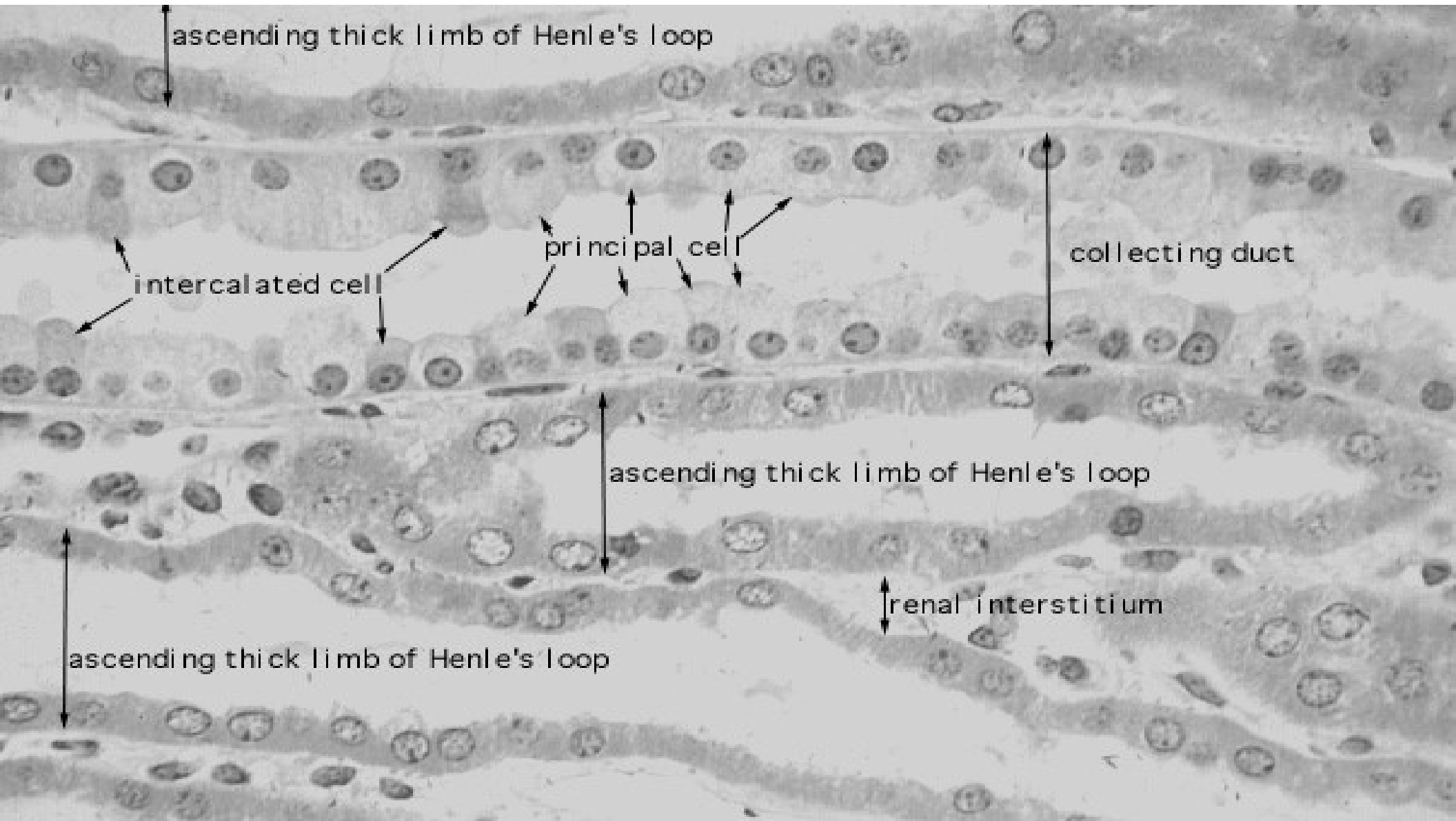
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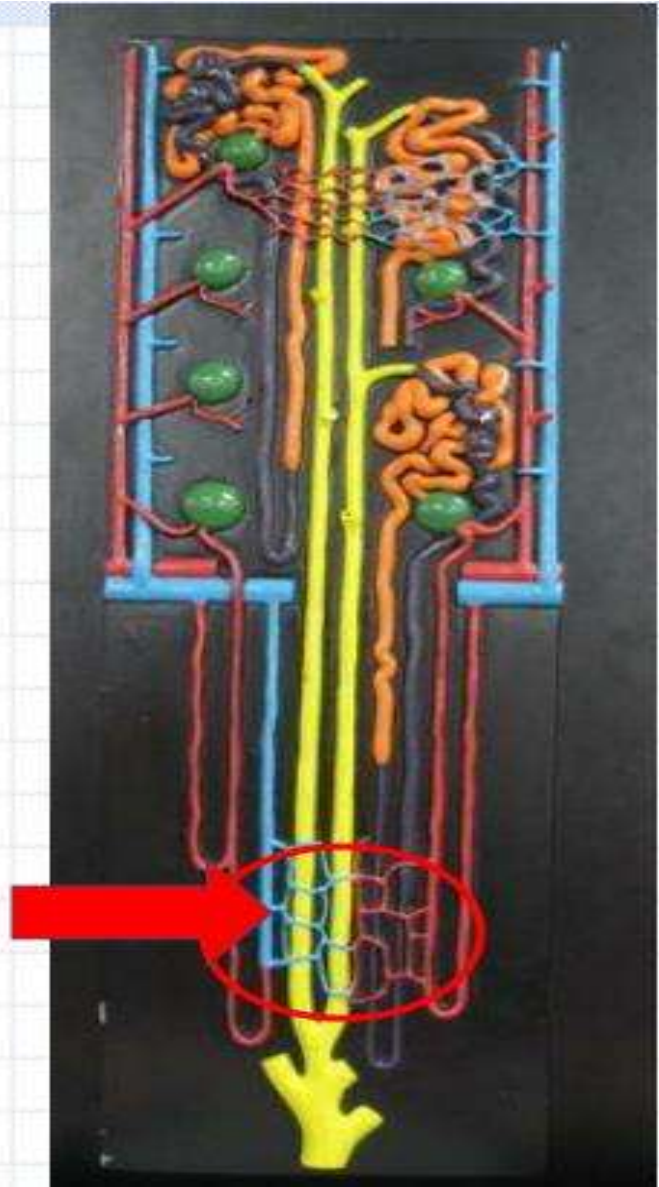
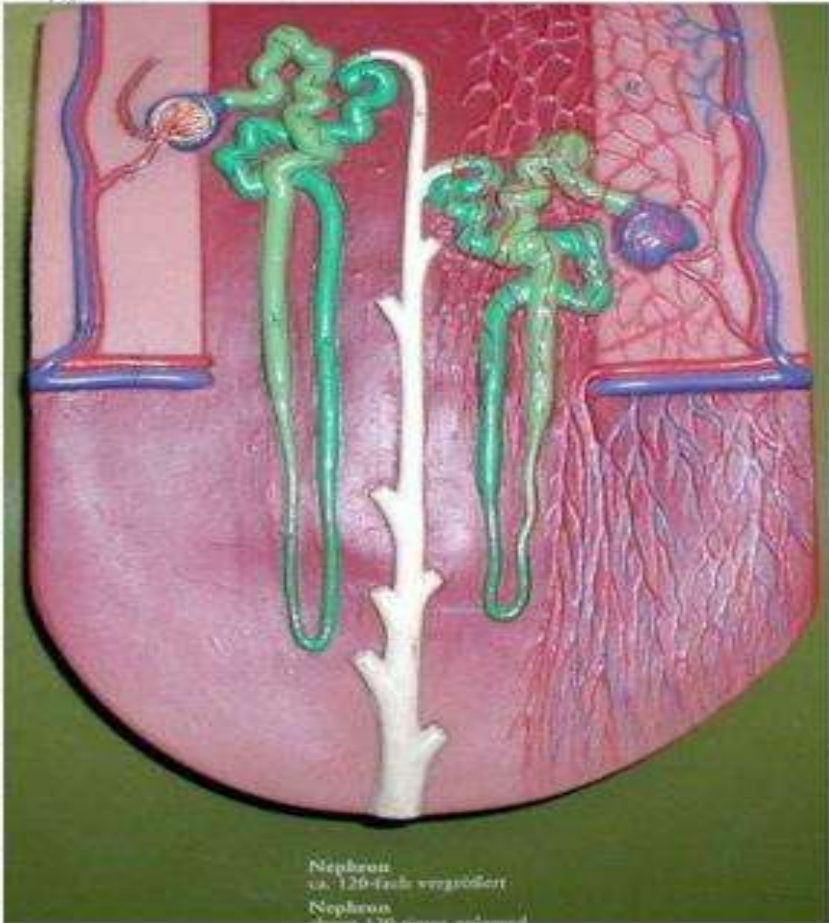
10 Efferent arteriole
9 Afferent arteriole

The process by which filtrate is formed, involving the balance of pressures across the walls of the glomerular capillaries. This is the first step in urine formation, where plasma is filtered into the capsular space of the nephron?.

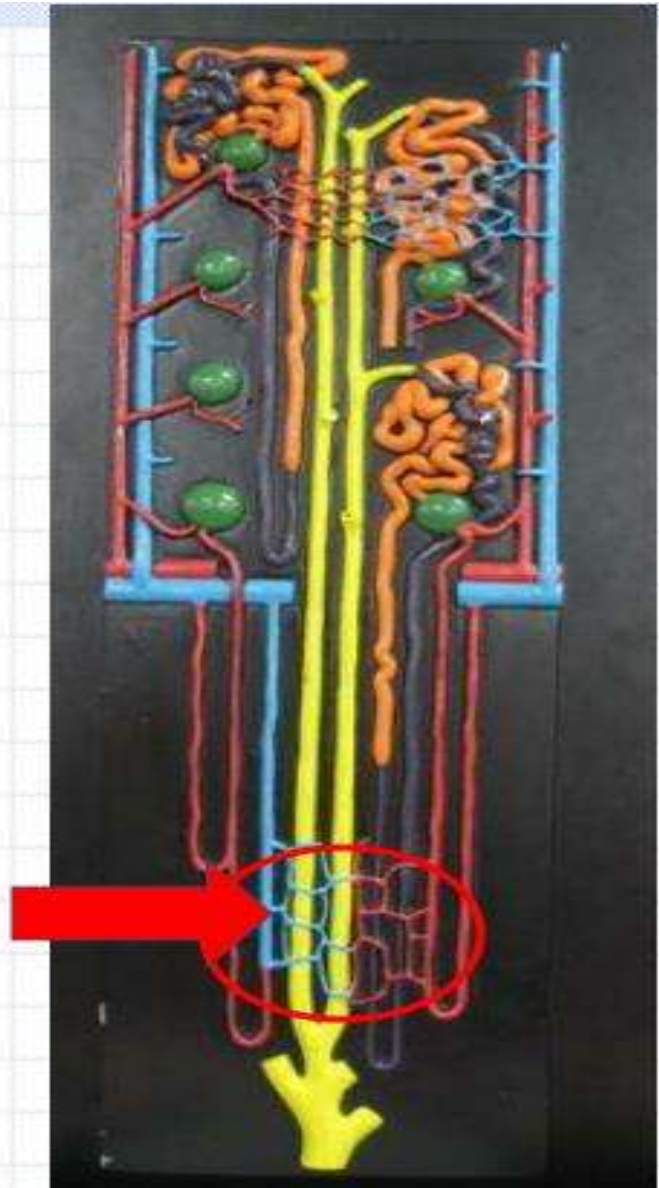
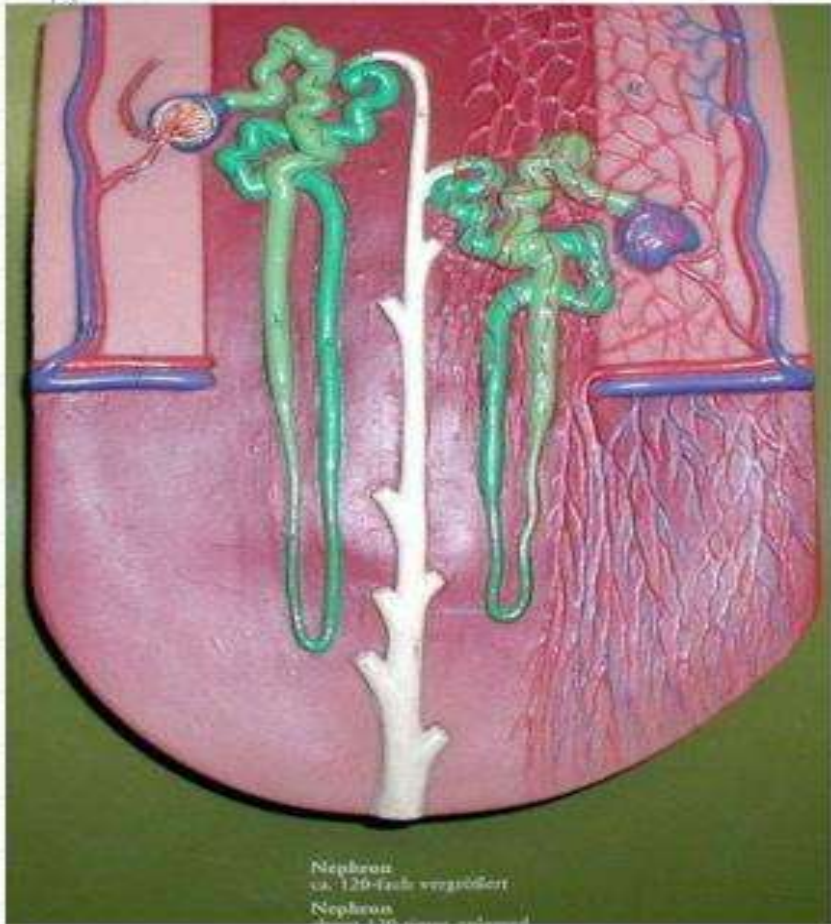
Glomerular filtration

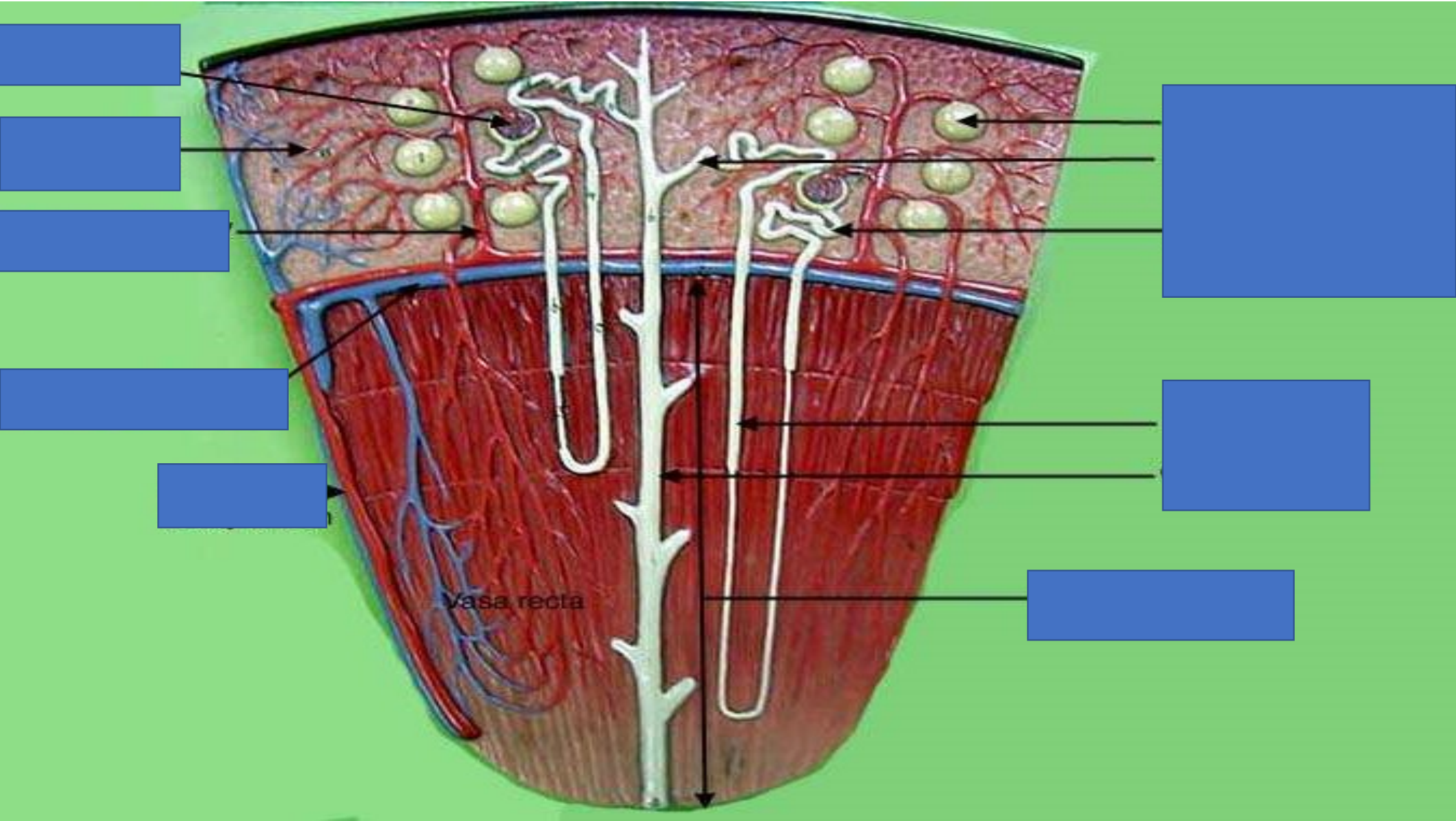




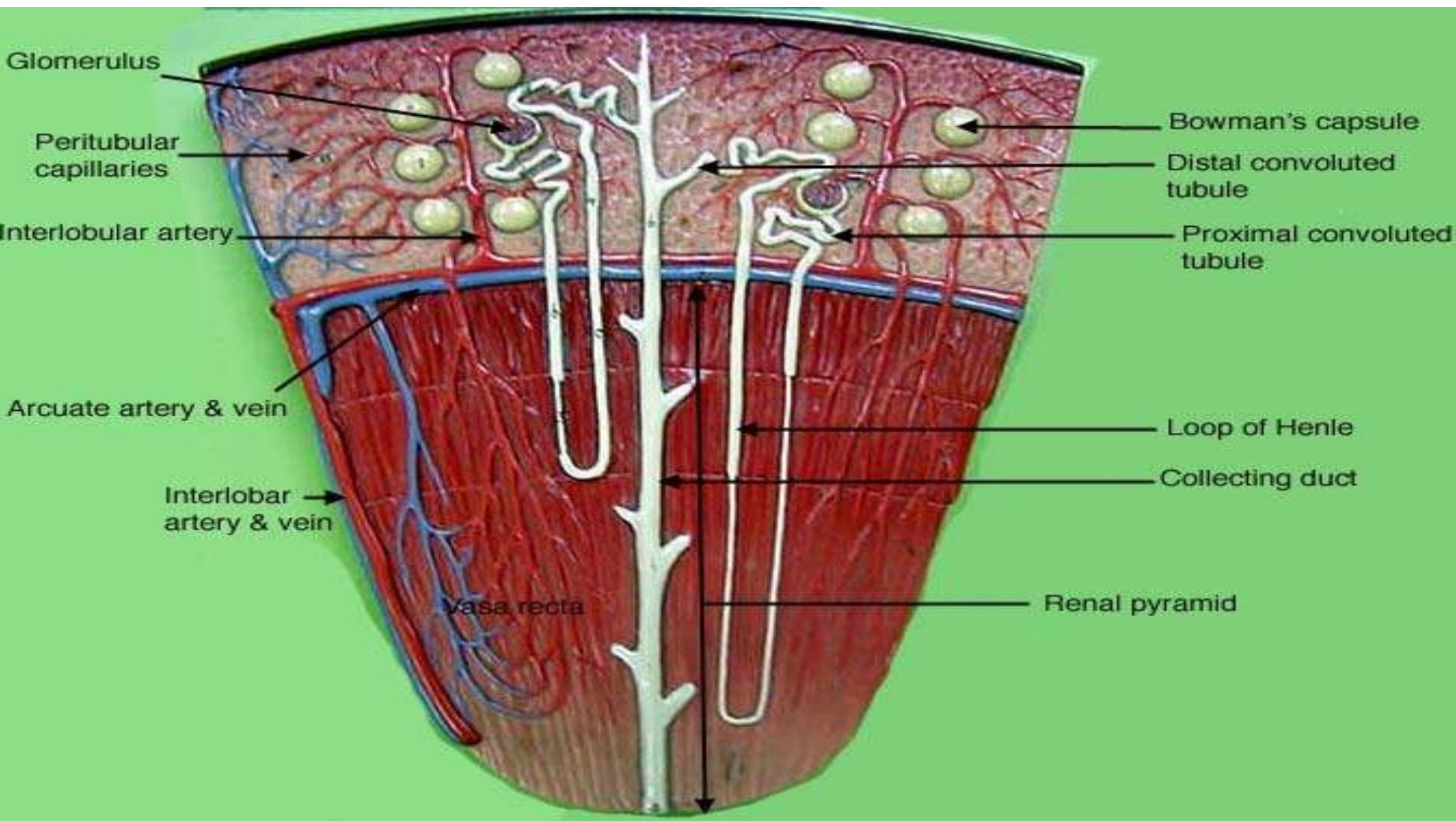


Vasa recta



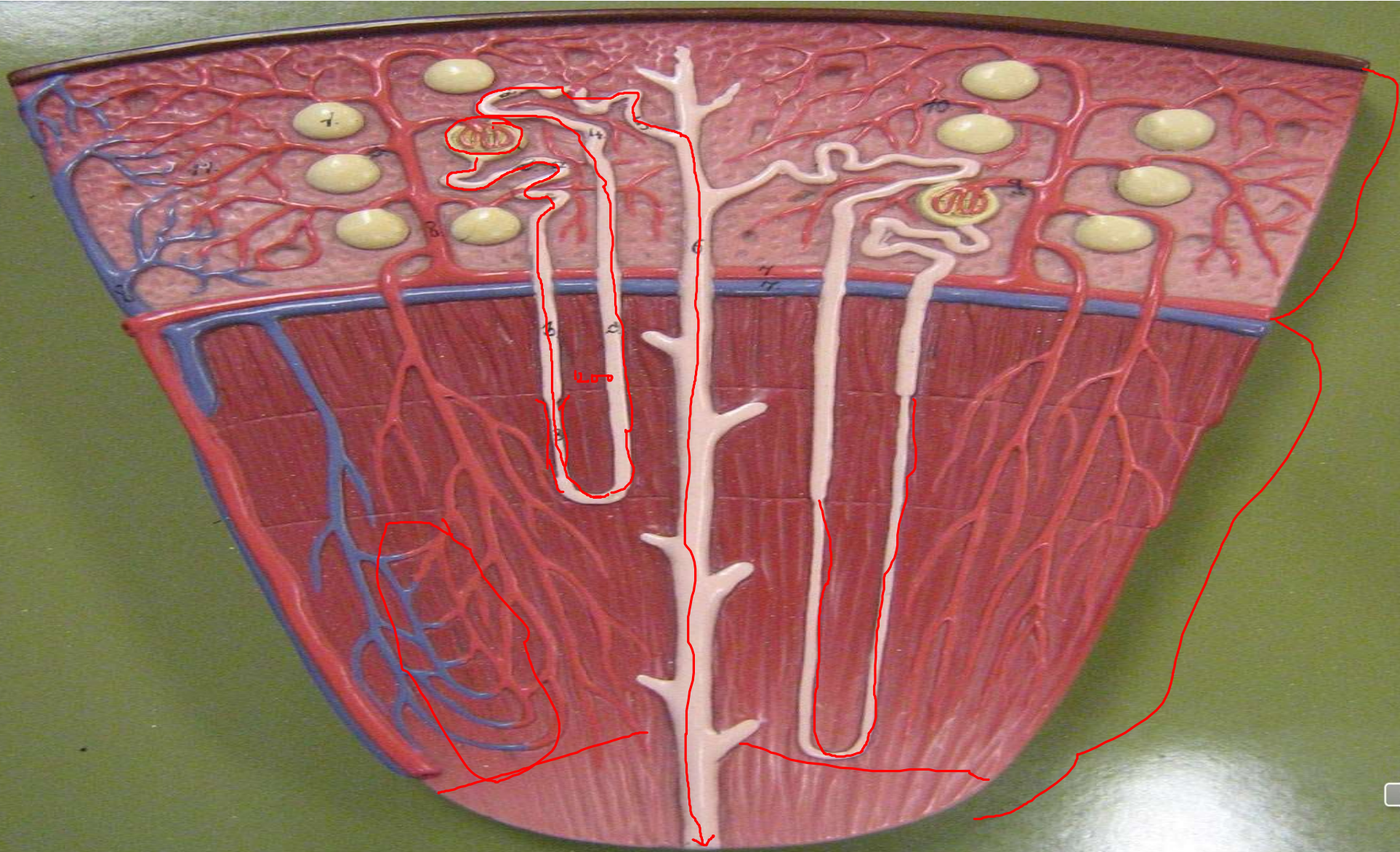


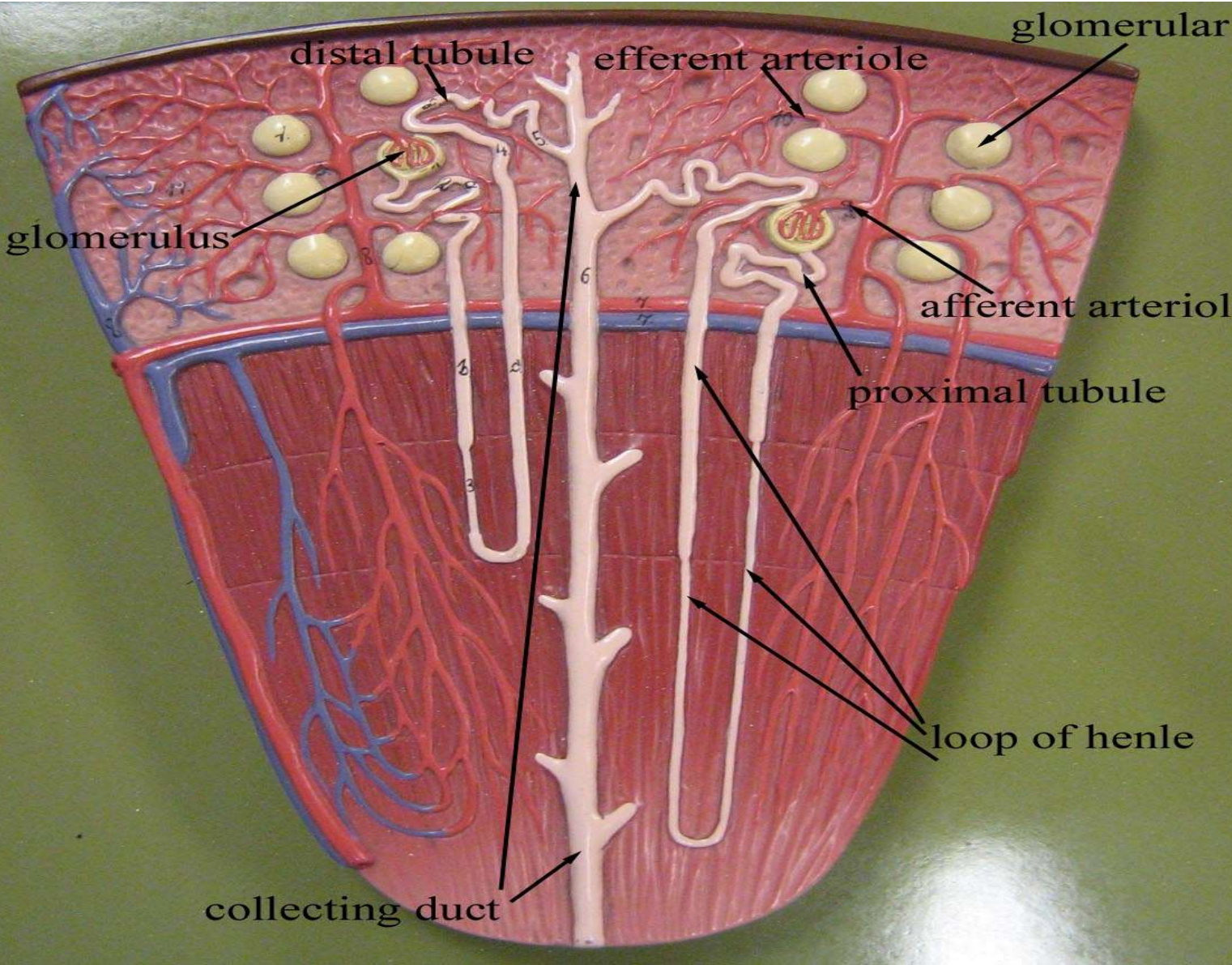
Vasa recta



What is the primary function of antidiuretic hormone (ADH) acting on the distal convoluted tubule?

Water reabsorption





distal tubule efferent arteriole glomerular capsule

glomerulus afferent arteriole

proximal tubule

loop of henle

collecting duct

renal cortex

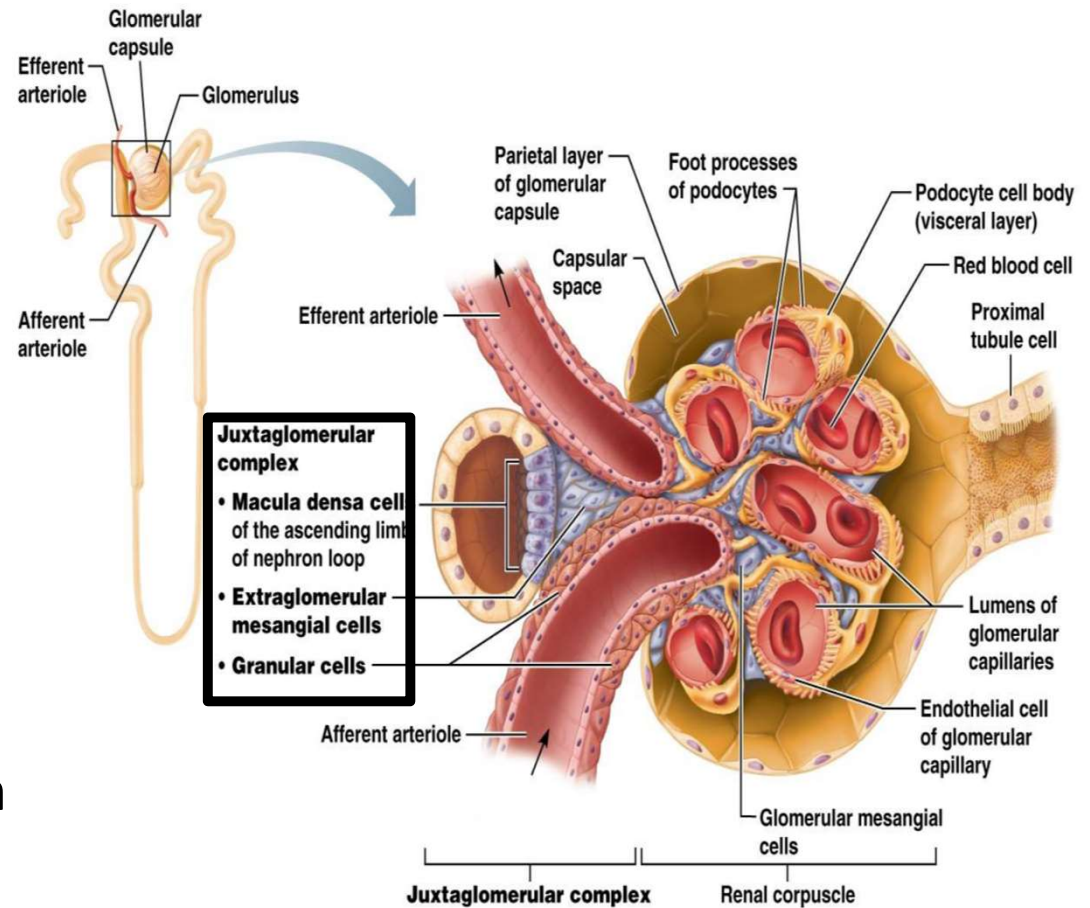
renal medulla



Juxtaglomerular Apparatus (JGA)?

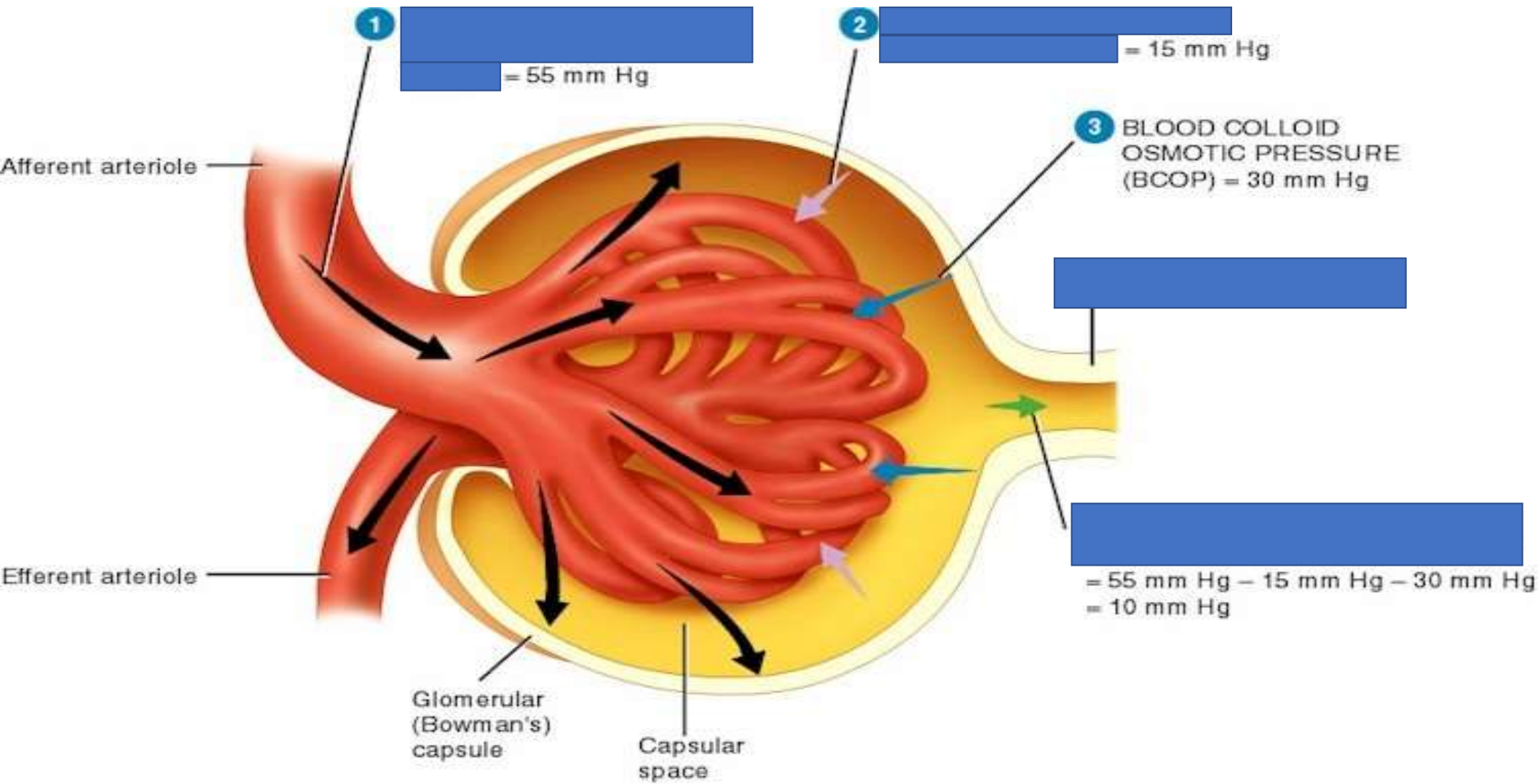
Macula densa – epithelial cells of the Ascending limb & distal convoluted tubule that are densely packed. These cells are chemo and osmoreceptors that detect changes in solute concentration and blood pressure.

• **Juxtaglomerular cells (Granular cells)** – large cells in the wall of the afferent arterioles that secrete renin and act as mechanoreceptor. **Renin** plays an important role in control of **blood pressure**.

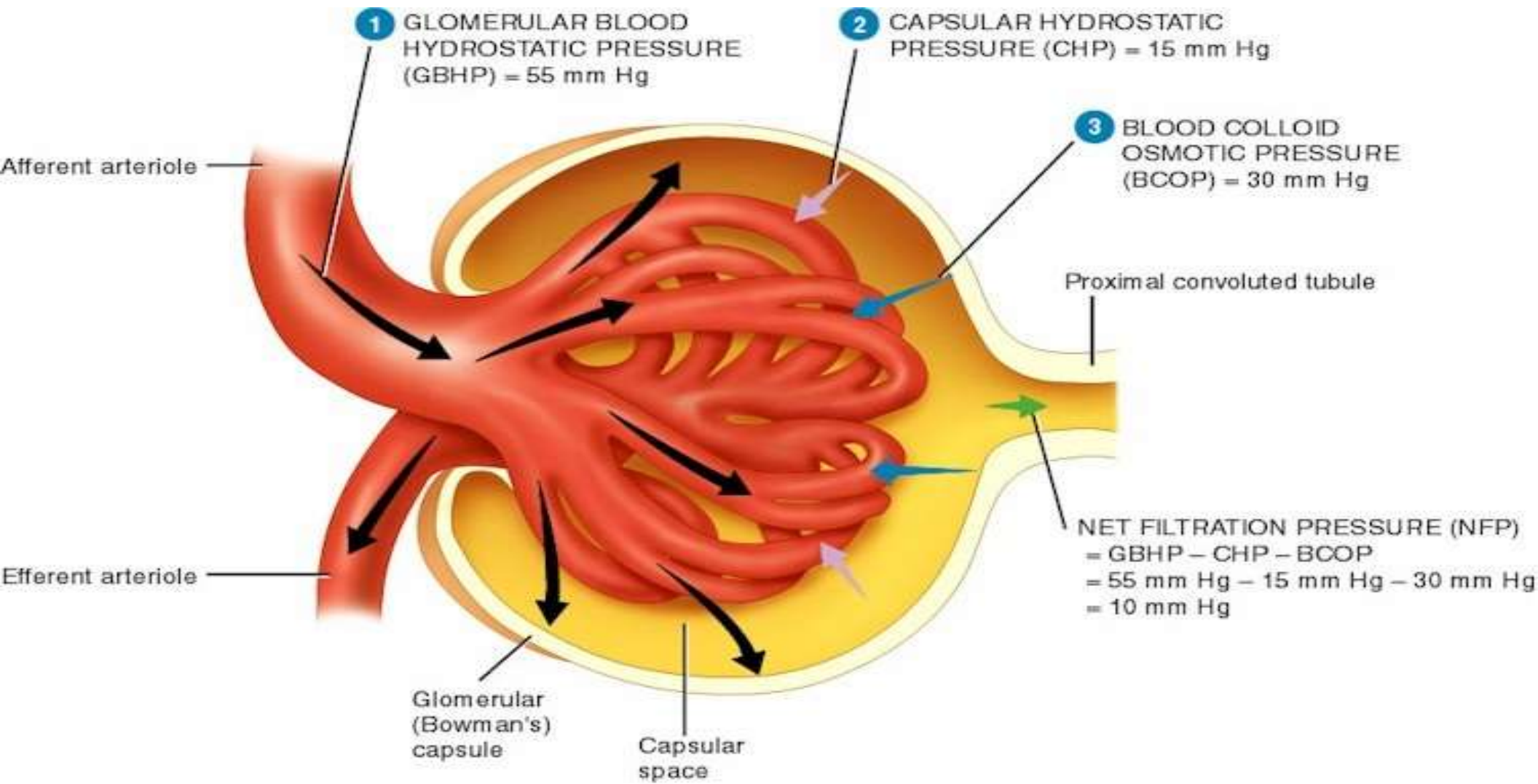


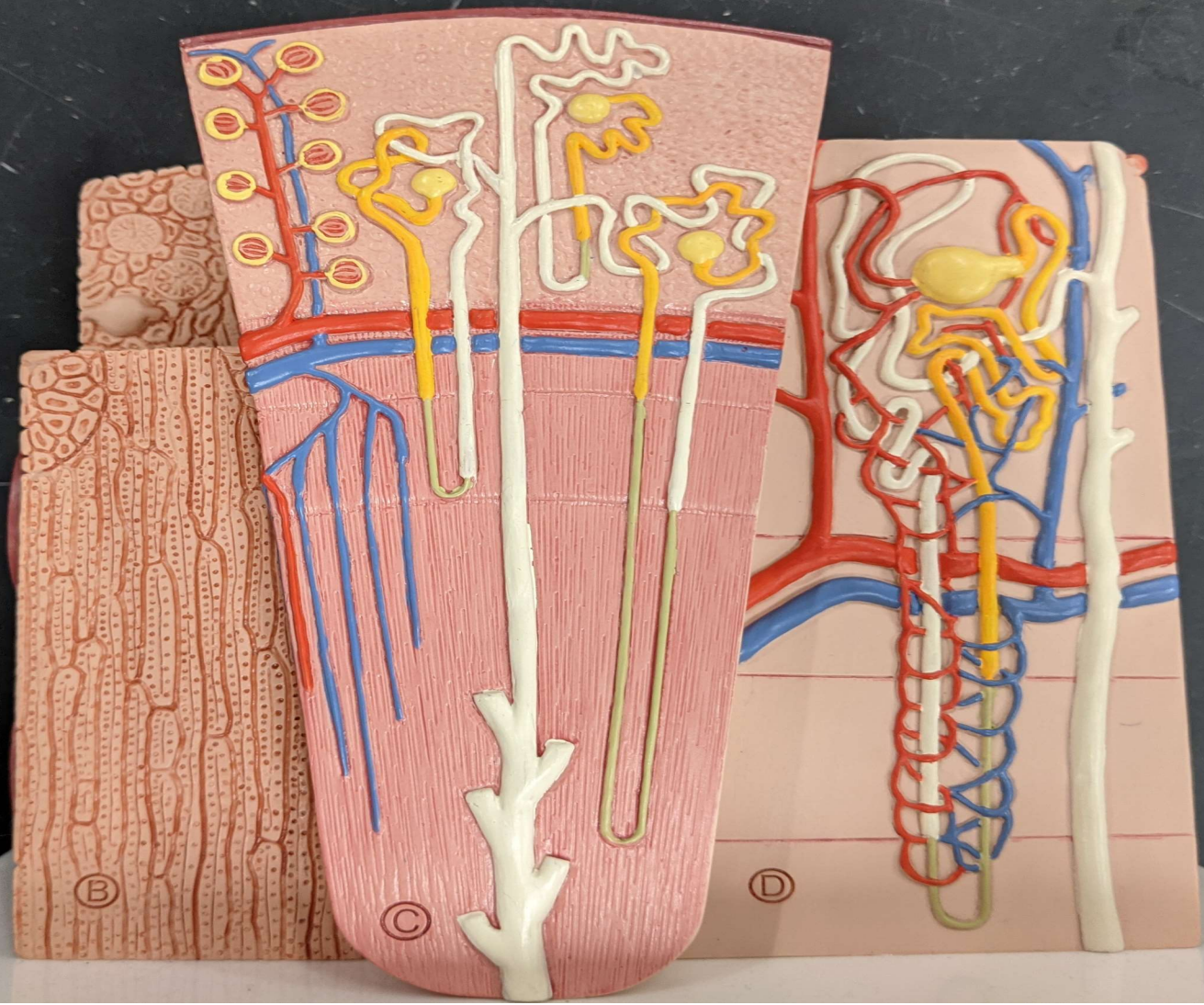
What do the macula densa cells sense/monitor?

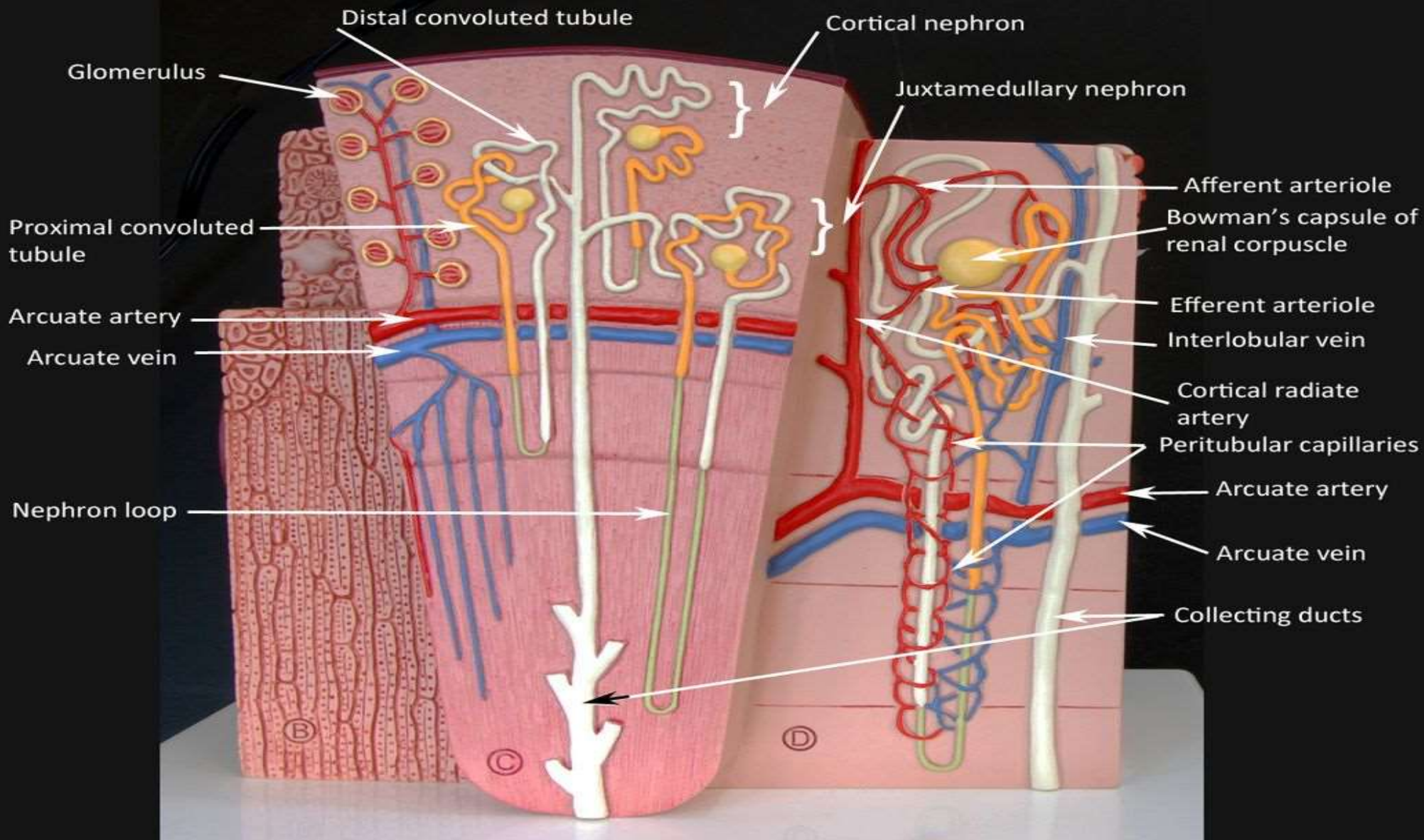
Sodium chloride concentration

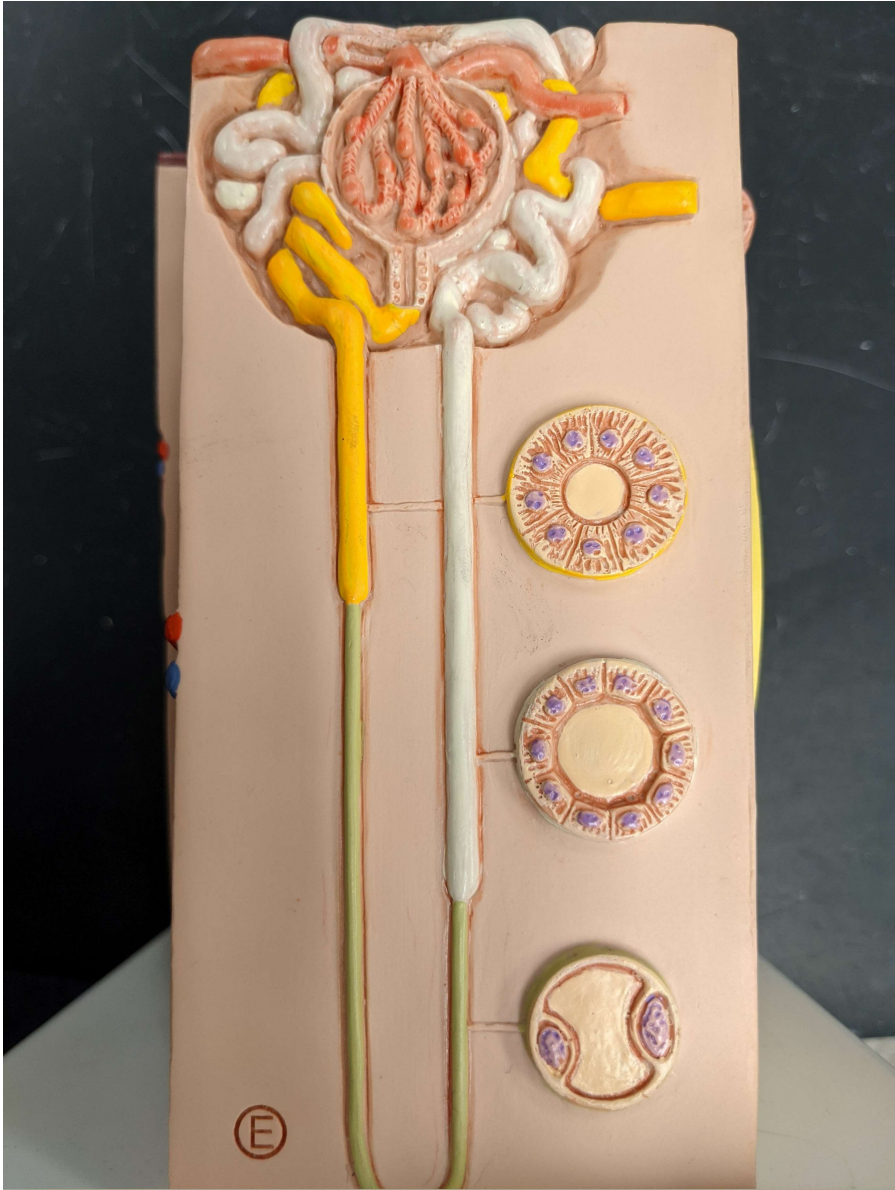


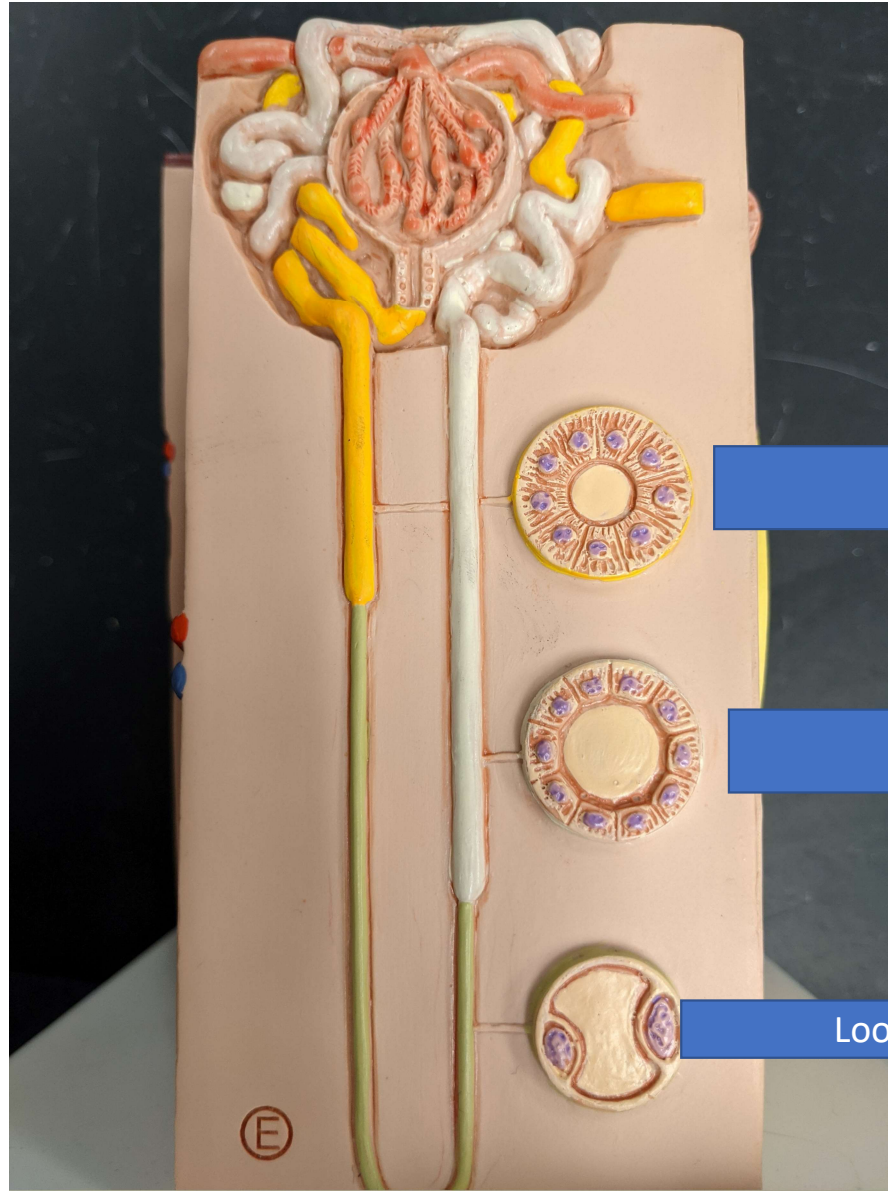
26.09











Proximal tubules

Ascending tubules

Loop of henle

What is the primary function of the loop of Henle?

Concentrates urine

Freely permeable to water. Not permeable to NaCl.
Filtrate becomes increasingly concentrated as
water leaves by osmosis.

Descending limb of the loop of Henle

The movement of substances from the filtrate back into the blood of the peritubular capillaries is called:

Tubular reabsorption



?



gettyimages
Ed Reschke

128124162

Urothelium= TRANSITIONAL EPITHELIUM , BLADDER

DOME CELLS = facet cells or umbrella cells

This epithelium is found lining the urinary bladder, ureters and urethra, as well as in the ducts of the prostate gland.



All transitional epithelial cells are covered in microvilli and a fibrillar mucous coat

tissue that changes shape in response to stretching (stretchable epithelium).

Cells in the basal layer are cuboidal or columnar.

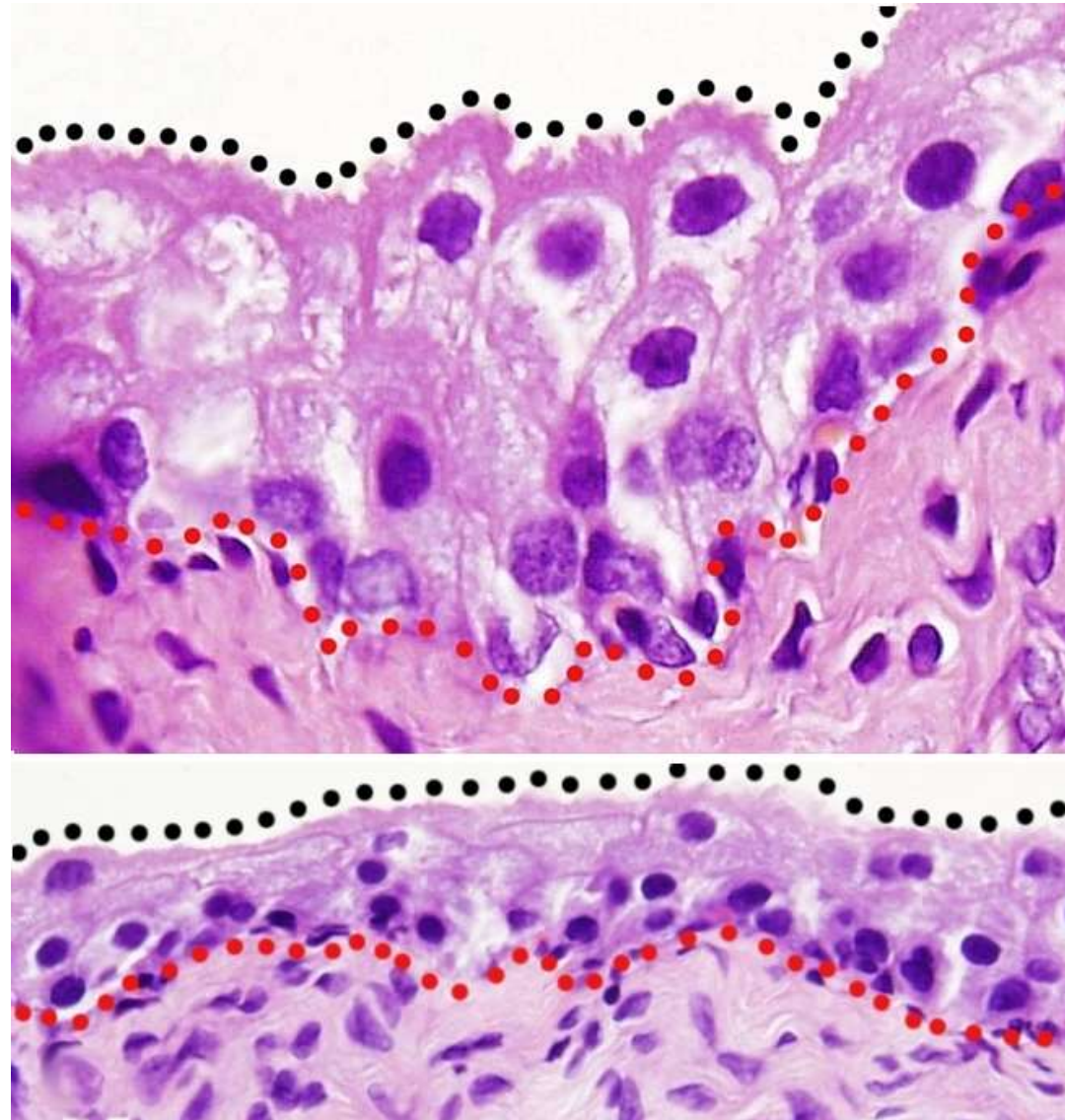
Cells by the apical surface vary in appearance depending if the organ is stretched at the time.

Transitional cells have the ability to change their shape which allows more urine to flow through.

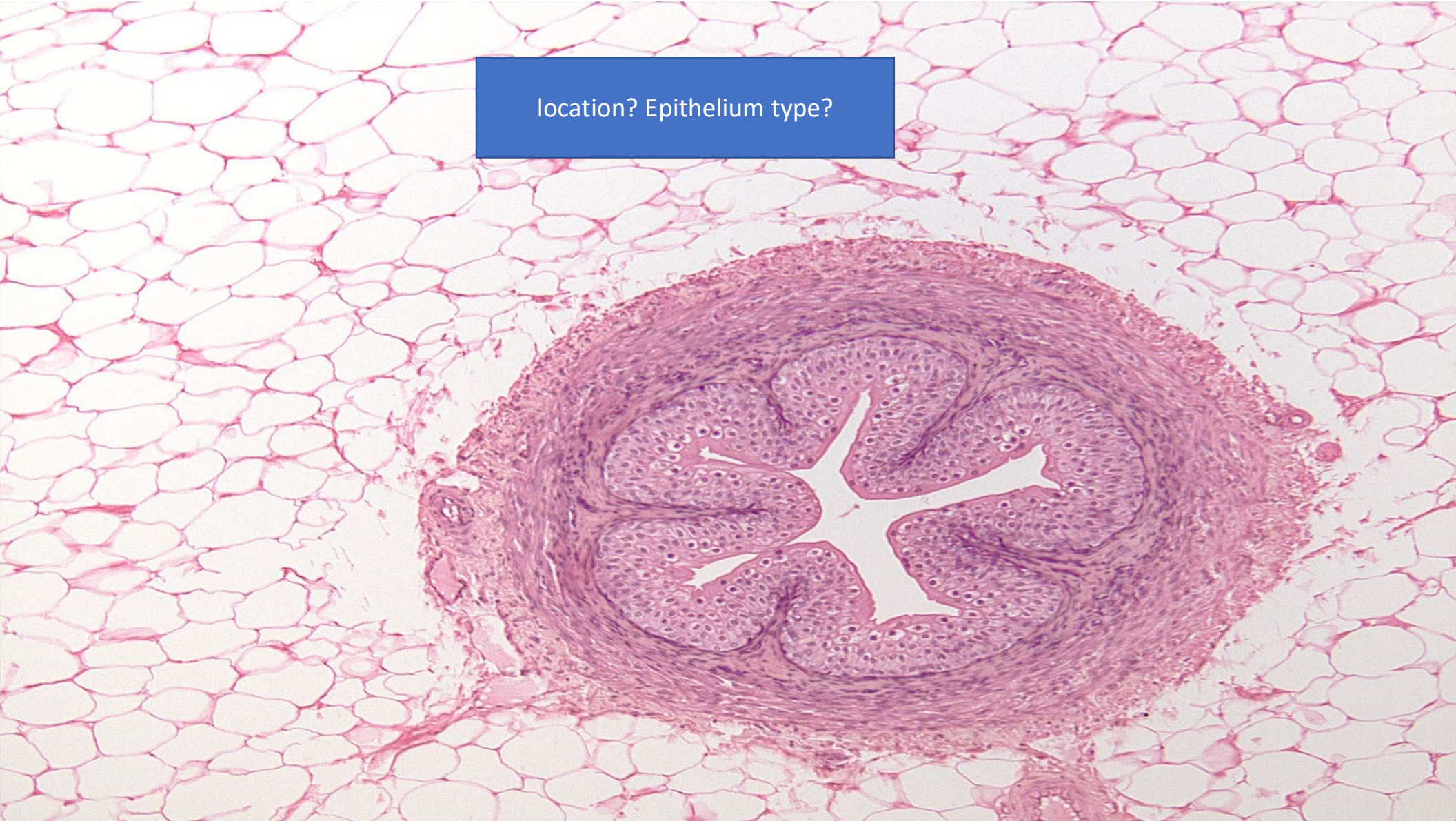
Which of these is true about transitional epithelium?

- A. It is a stratified epithelium
- B. The cells of the basal layer are connected to lamina propria through desmosomes
- C. The cells on the apical surface contain multiple projections on their plasma membrane made of microtubules called microvilli
- D. The cells on the apical surface contain plaques on their plasma membrane made of a carbohydrate called uroplakin.

- Which of these is true about transitional epithelium?
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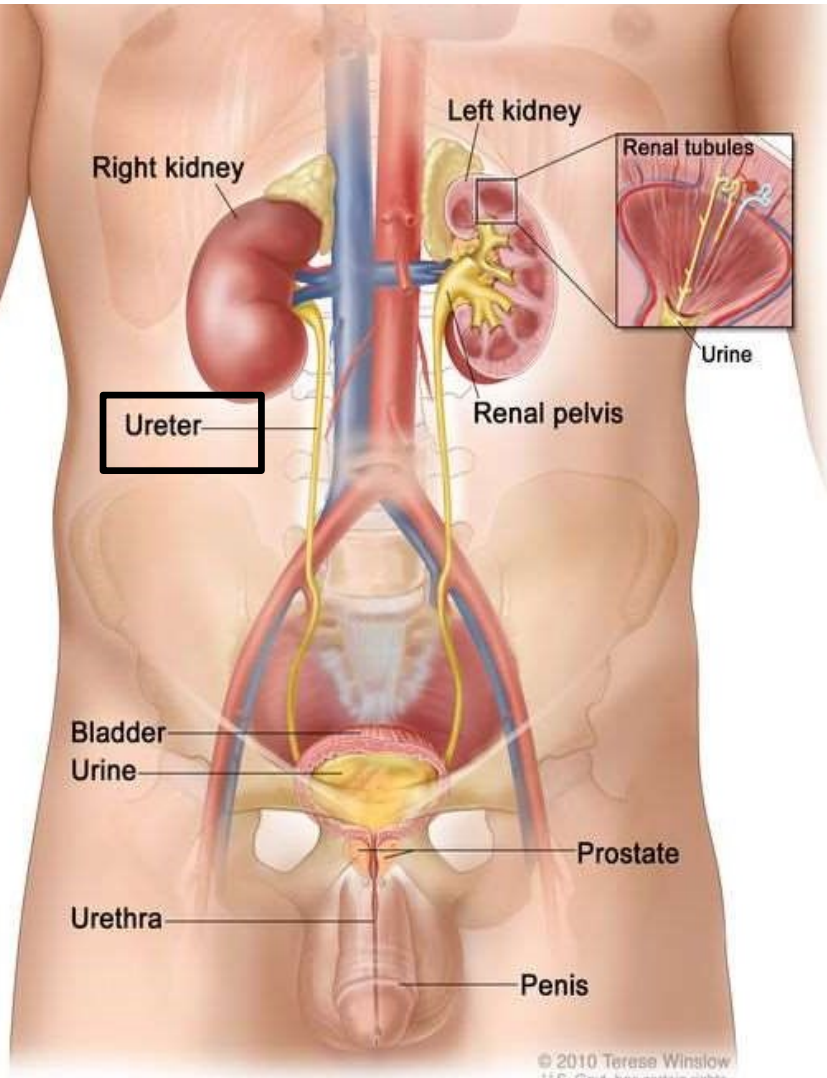


location? Epithelium type?

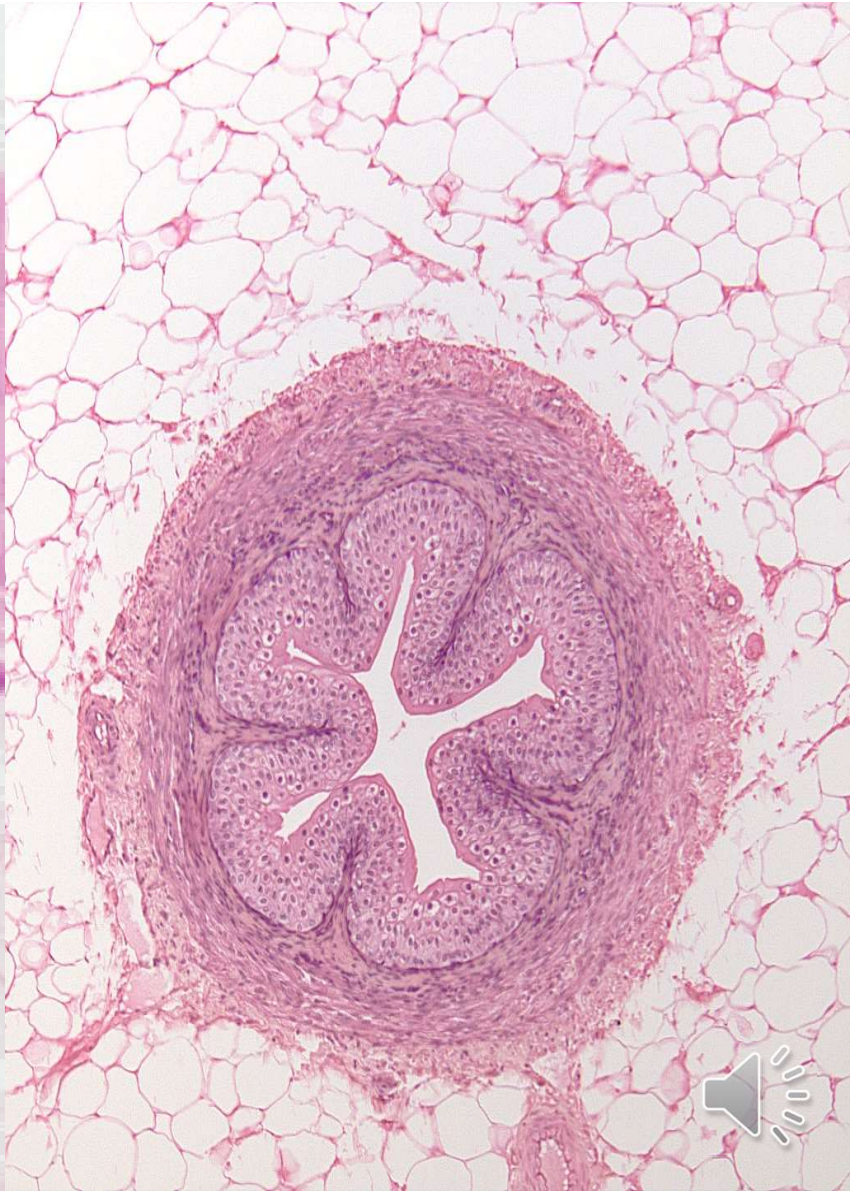
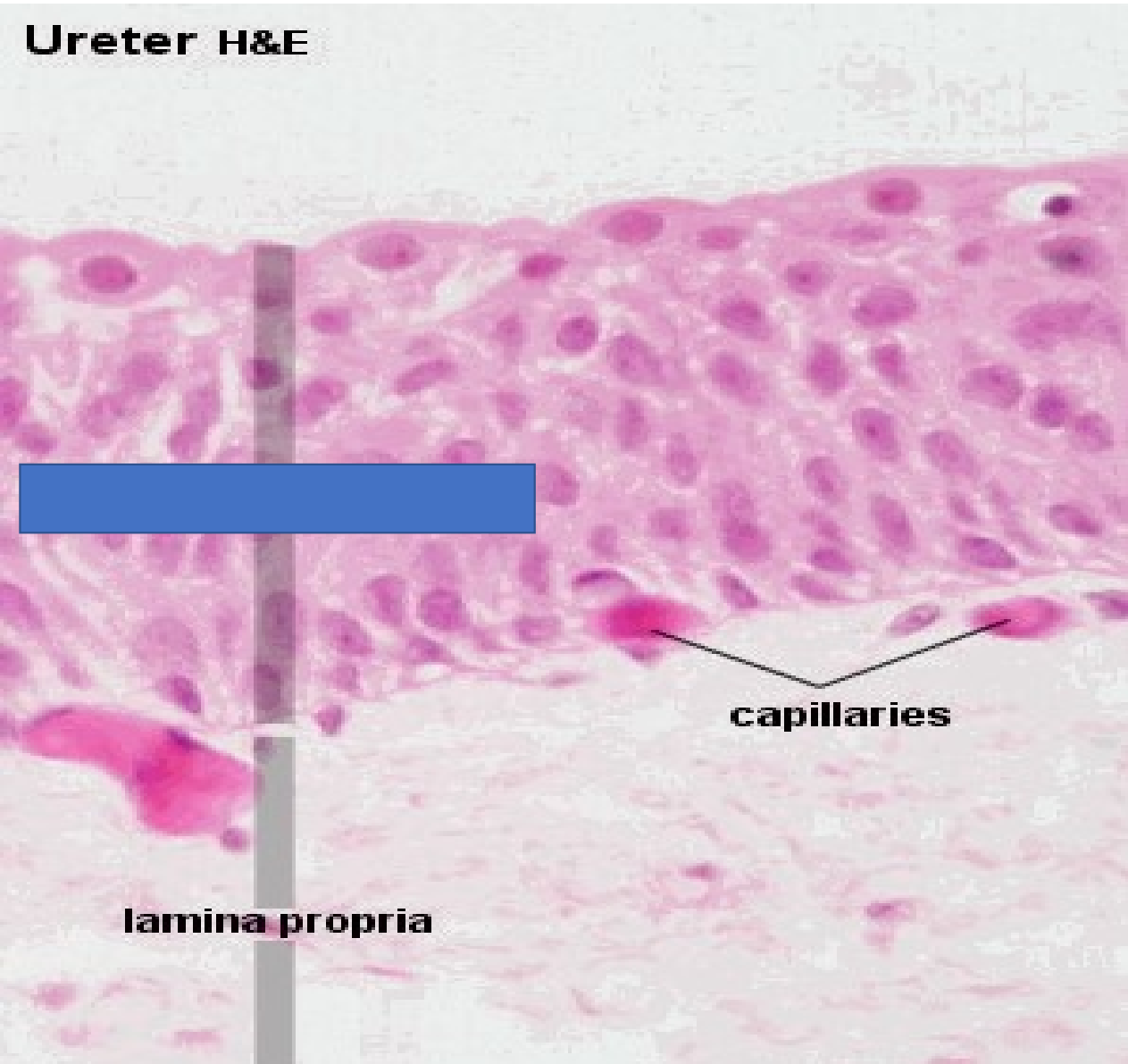


The right ureter lies in close relationship to the ascending colon, cecum, and appendix. The left ureter is close to the descending and sigmoid colon.

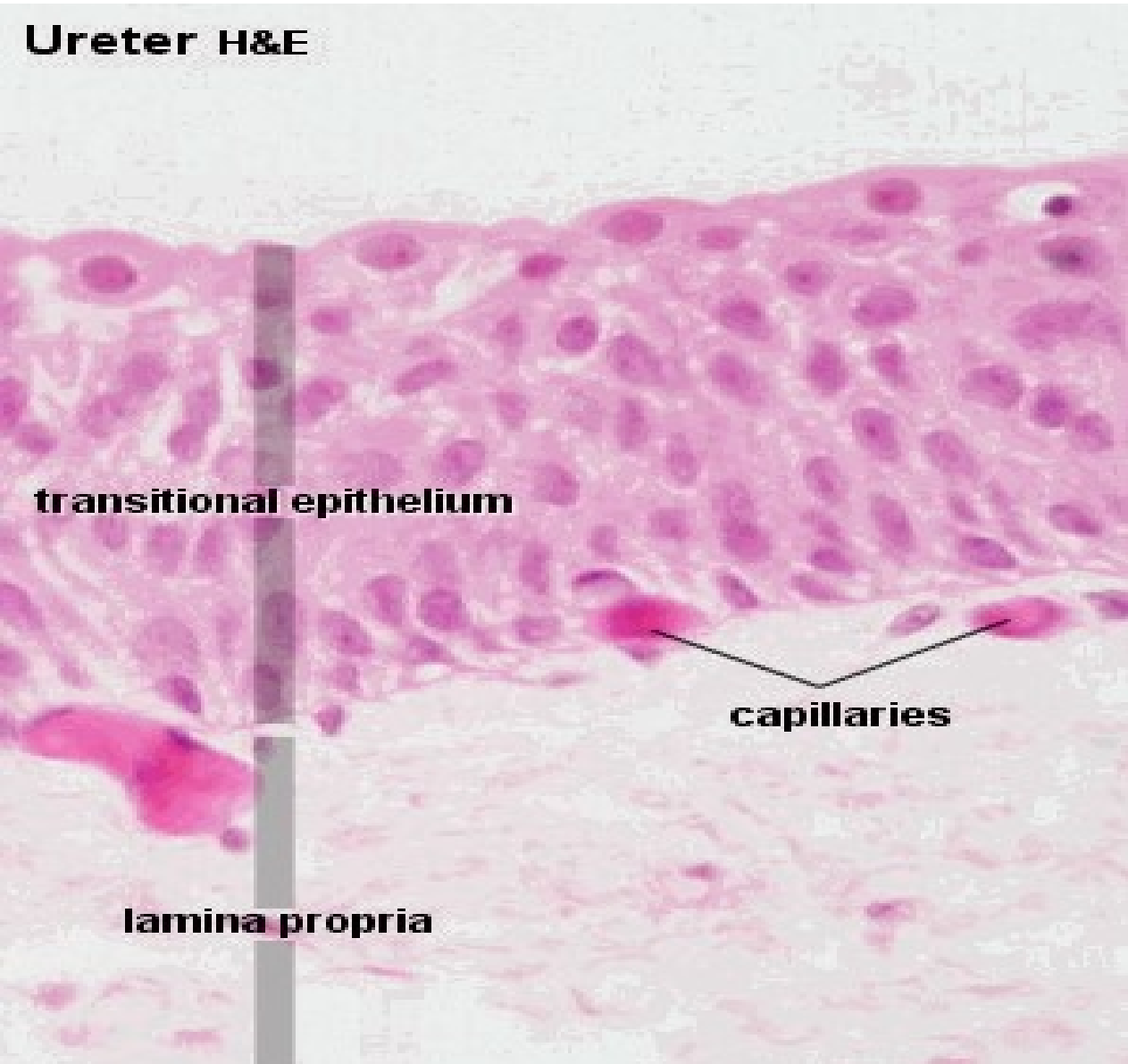
Ureter, transitional epithelium

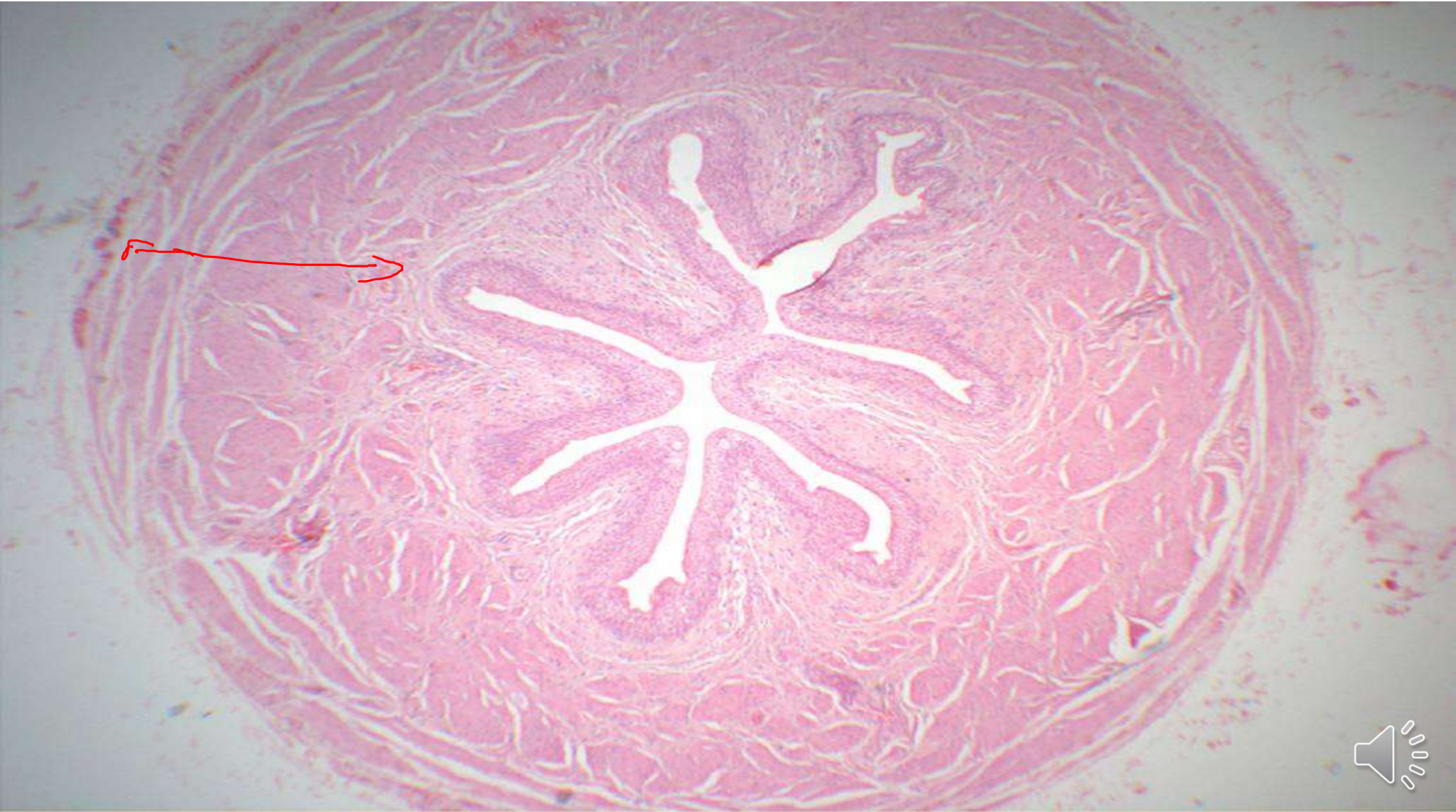


Ureter H&E

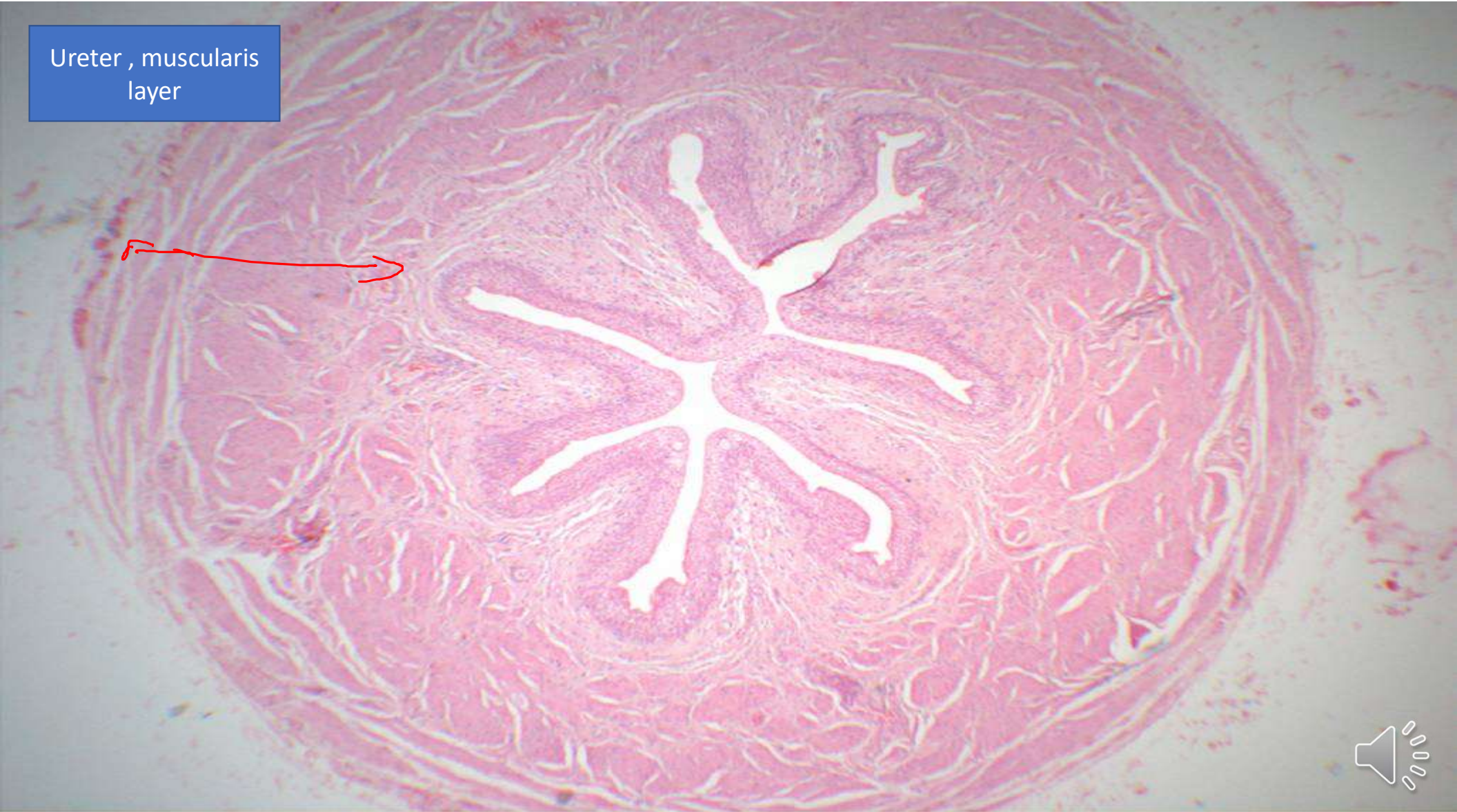


Ureter H&E

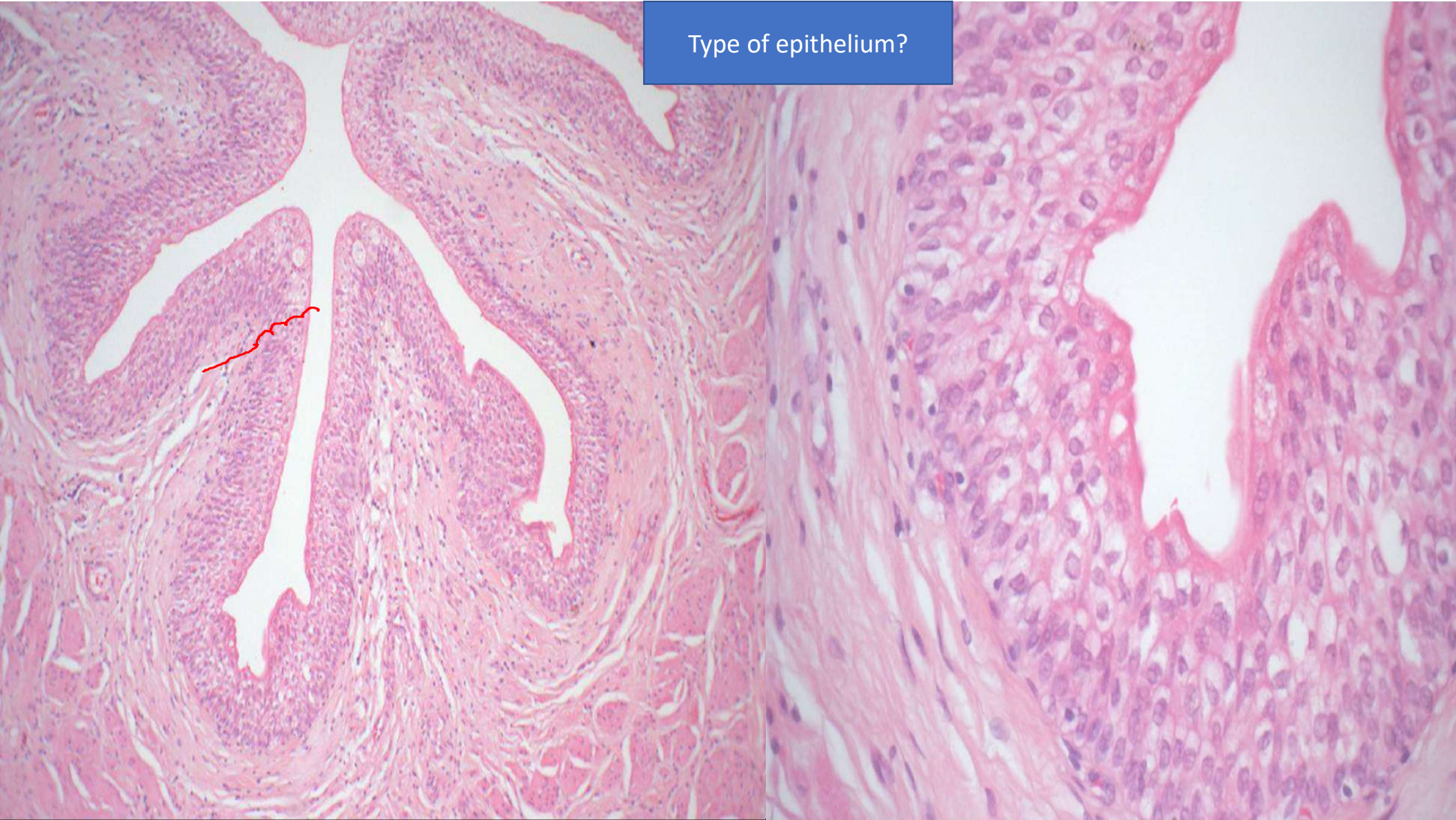




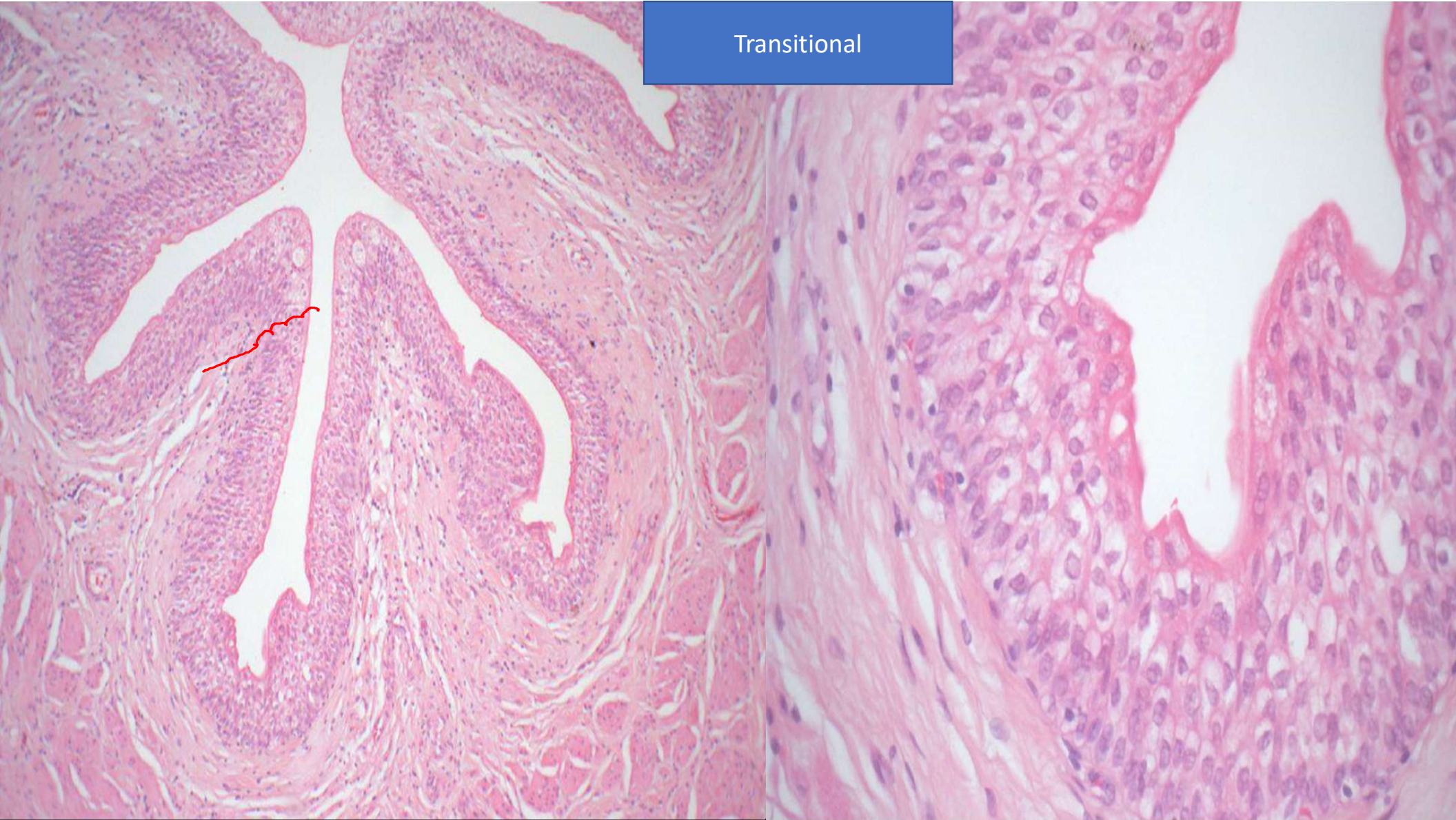
Ureter, muscularis layer



Type of epithelium?



Transitional



URINE FLOW?

Urine Formation

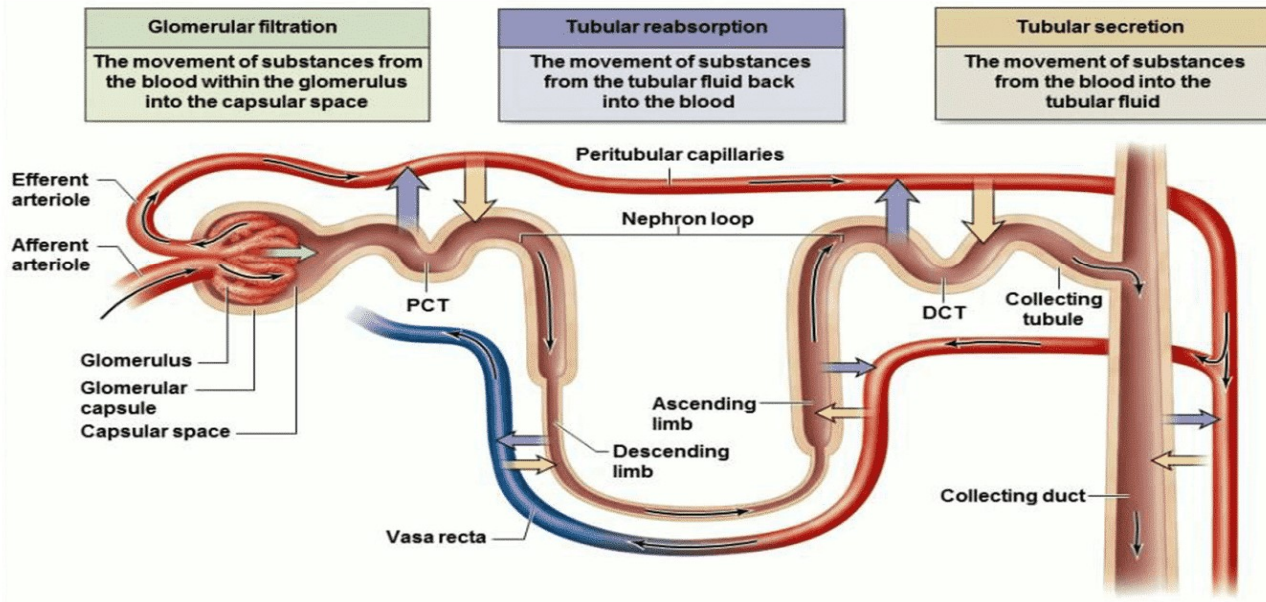
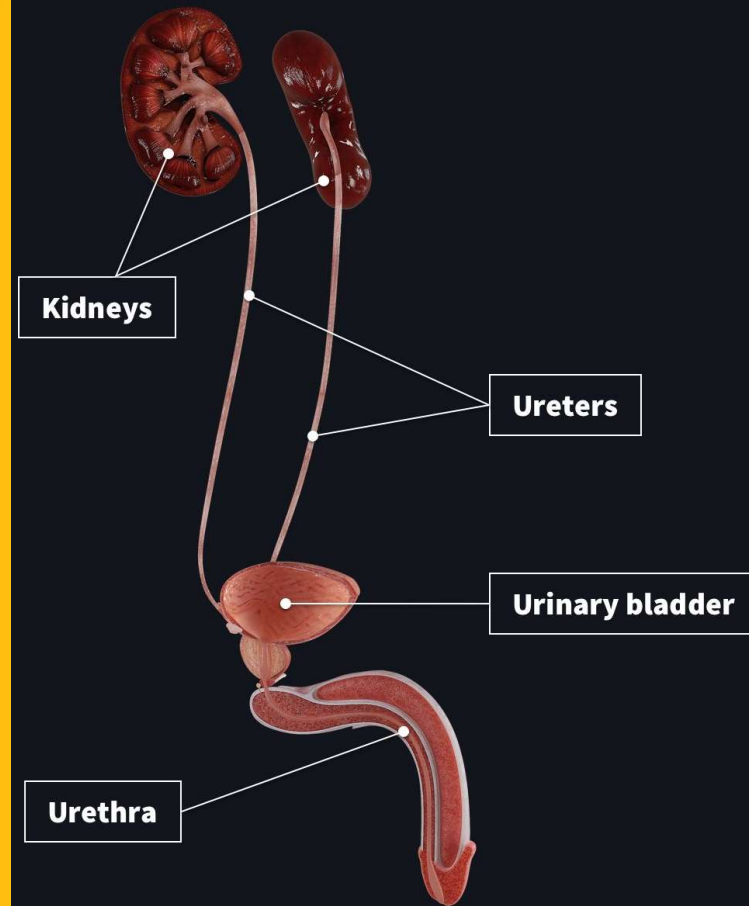
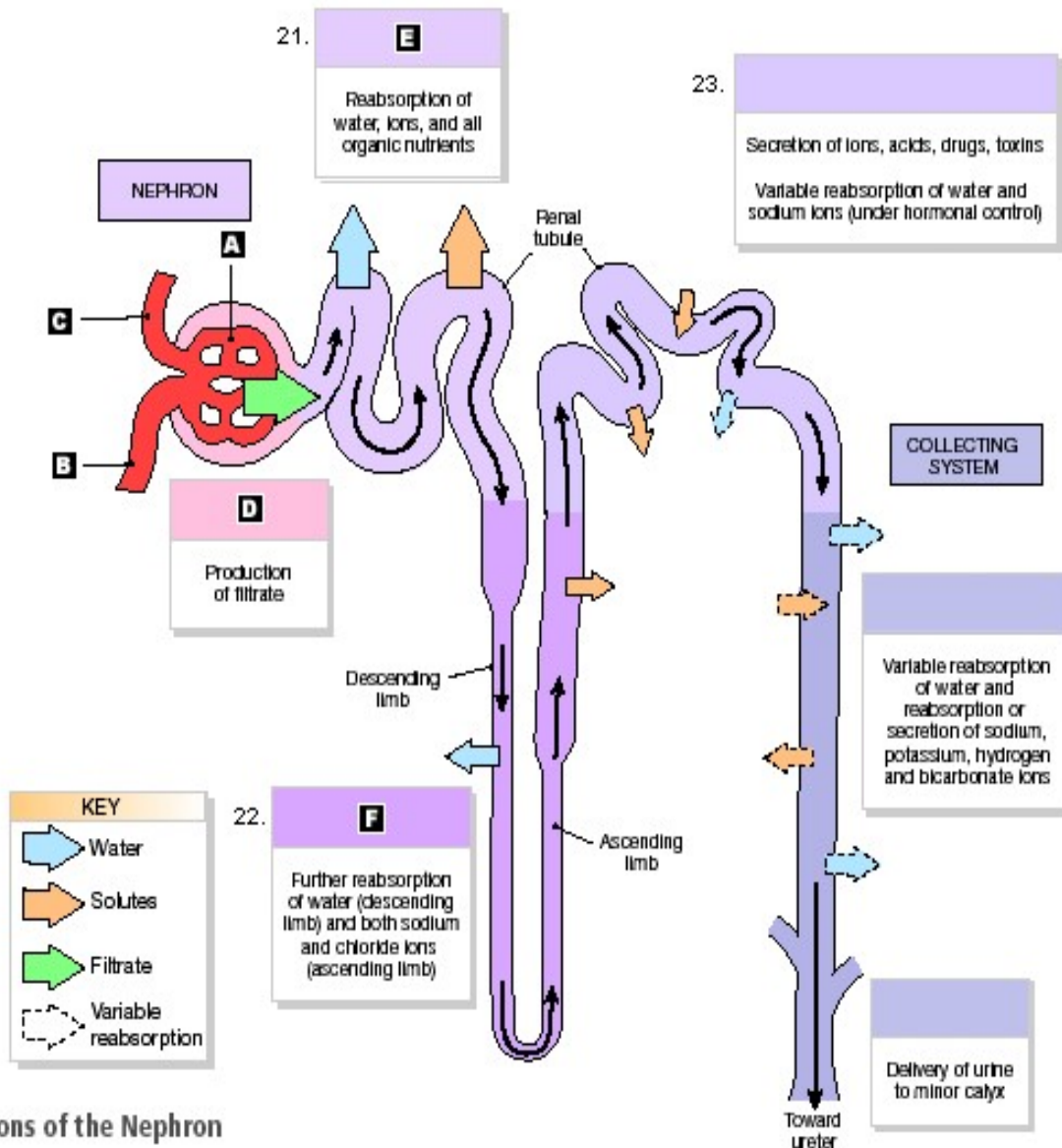


image via: youtube.com

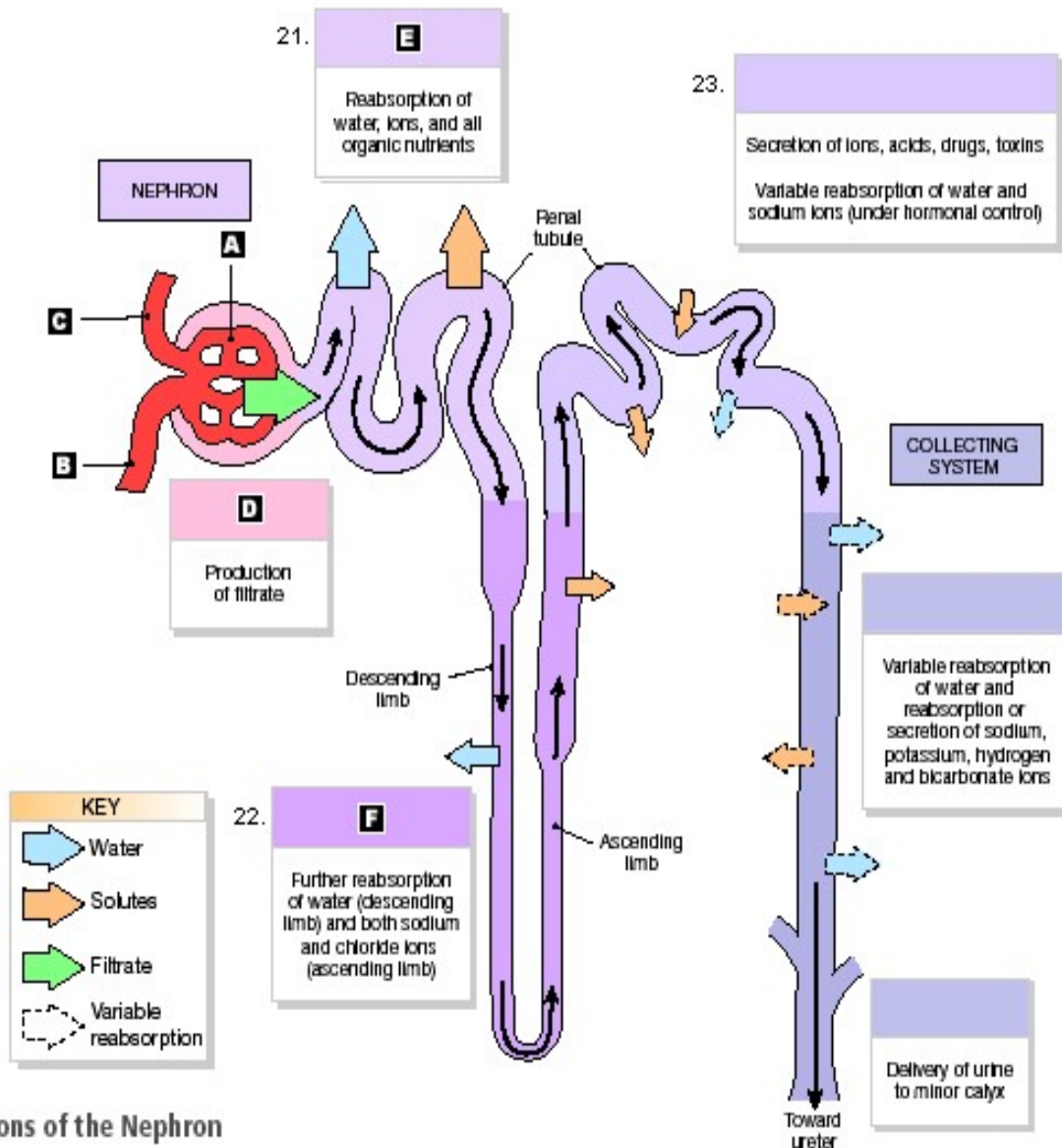


Glomerulus---> Bowman's capsule---> proximal tube---> descending loop of henle---> ascending loop of Henle---> DCT distal convoluted tubule---> collecting duct---> papillary duct---> minor calyx---> major calyx---> renal pelvis---> ureter---> bladder---> urethra---> and out of the body



- Renal corpuscle . . .
- Glomerulus . . .
- Afferent arteriole . . .
- Loop of Henle . . .
- Efferent arteriole . . .
- Proximal convoluted tubule . . .

Functions of the Nephron



- Renal corpuscle . D.
- Glomerulus . A.
- Afferent arteriole . B.
- Loop of Henle . F.
- Efferent arteriole . C.
- Proximal convoluted tubule . E.

Functions of the Nephron

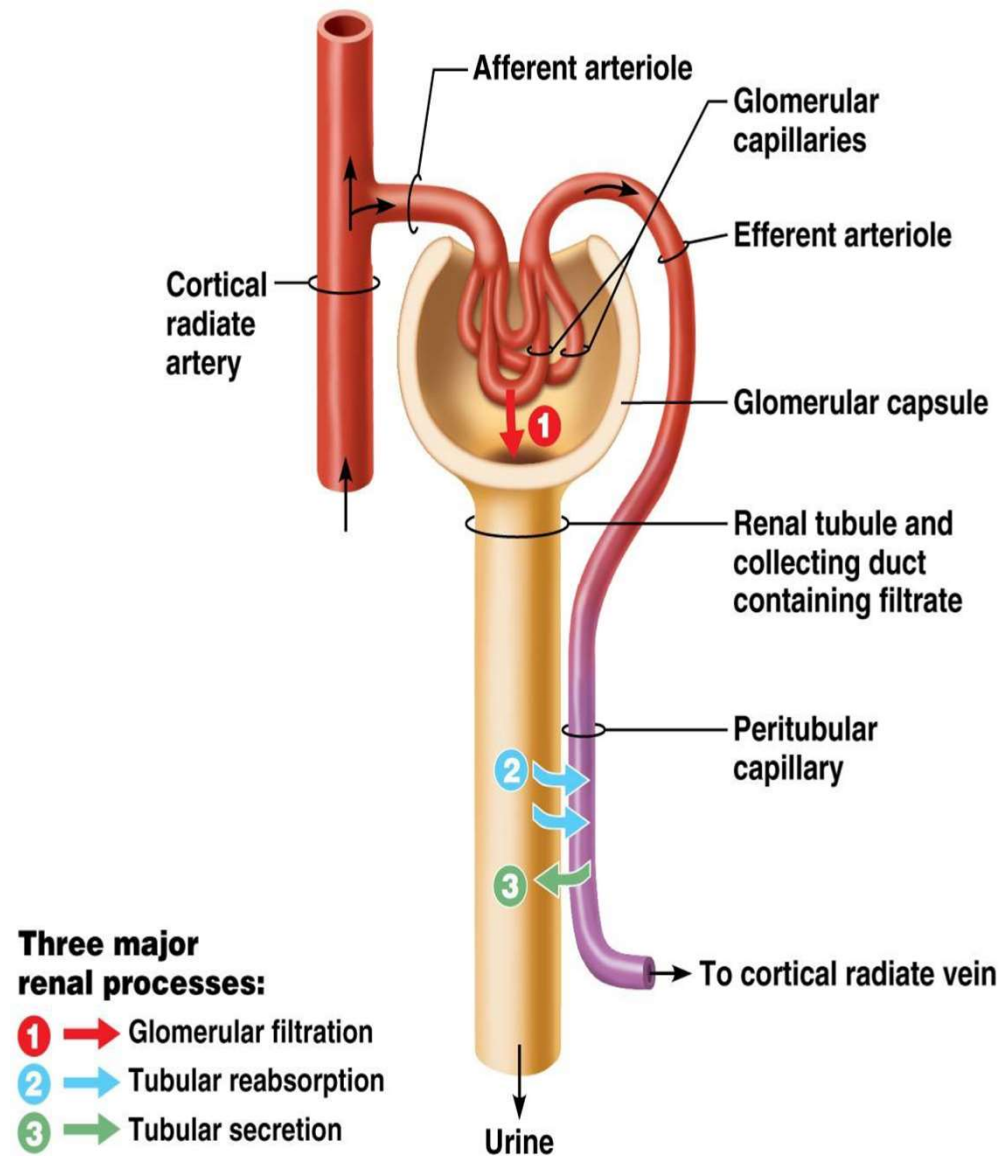
Urine formation involves 4 processes?

filtration – small molecules are filtered from glomerulus to bowman's capsule.

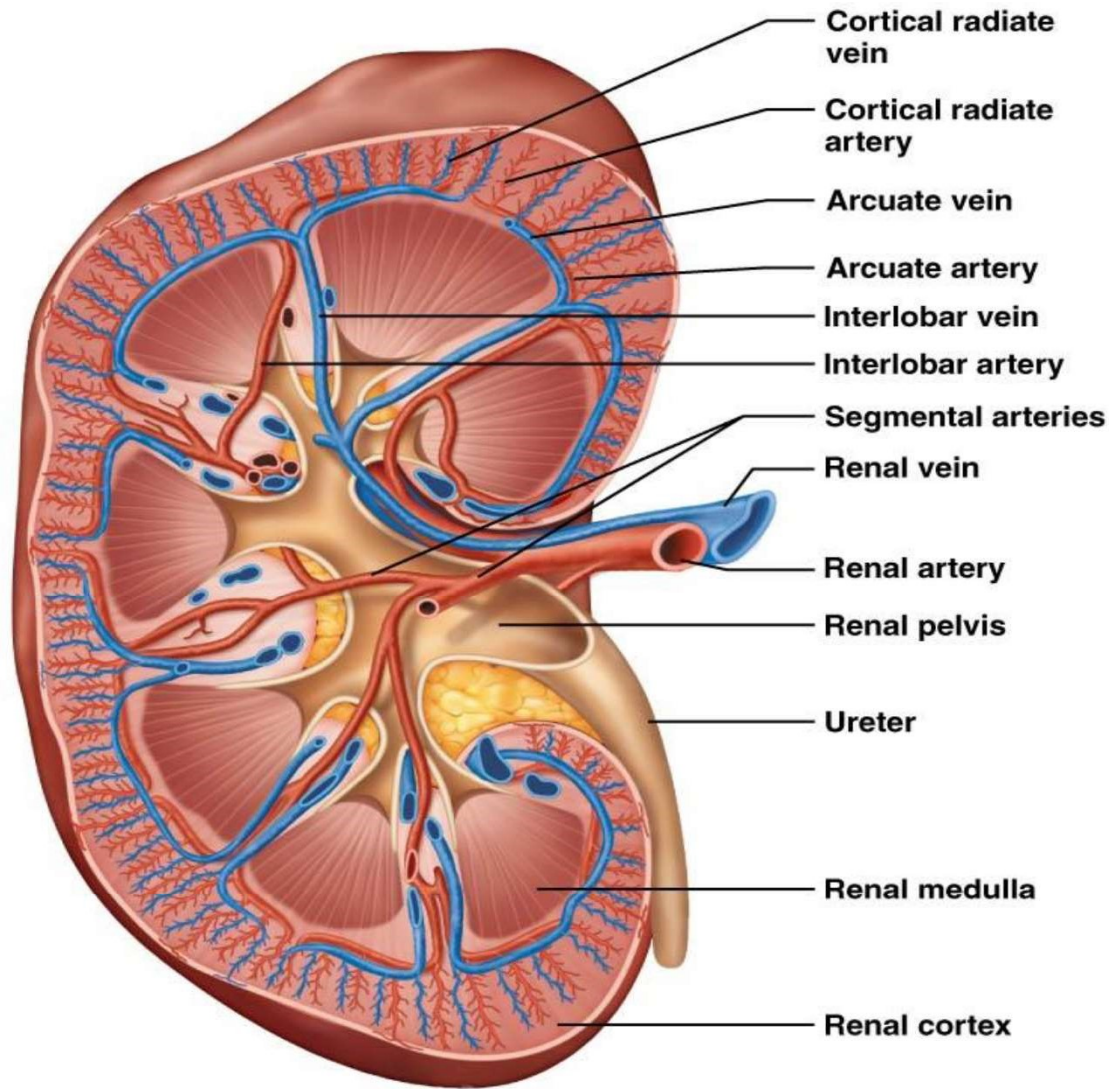
• **reabsorption** – nutrient molecules are transported from PCT and DCT to peritubular capillaries.

• **concentration** – water is reabsorbed from descending limb of loop of henle and from collecting duct into peritubular capillaries.

• **secretion** – waste or harmful substances are transported from peritubular capillaries to PCT and DCT.

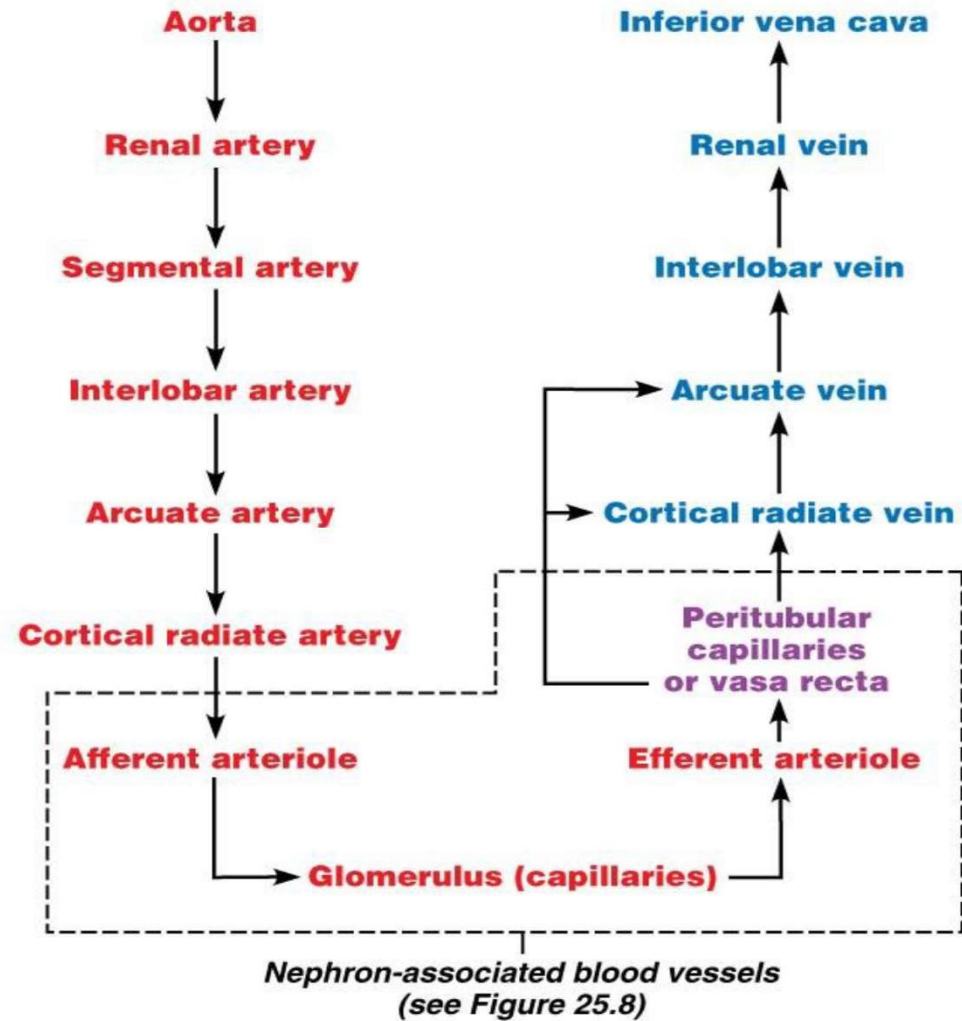


Blood flow from Aorta to inferior Vena Cava?



(a) Frontal section illustrating major blood vessels

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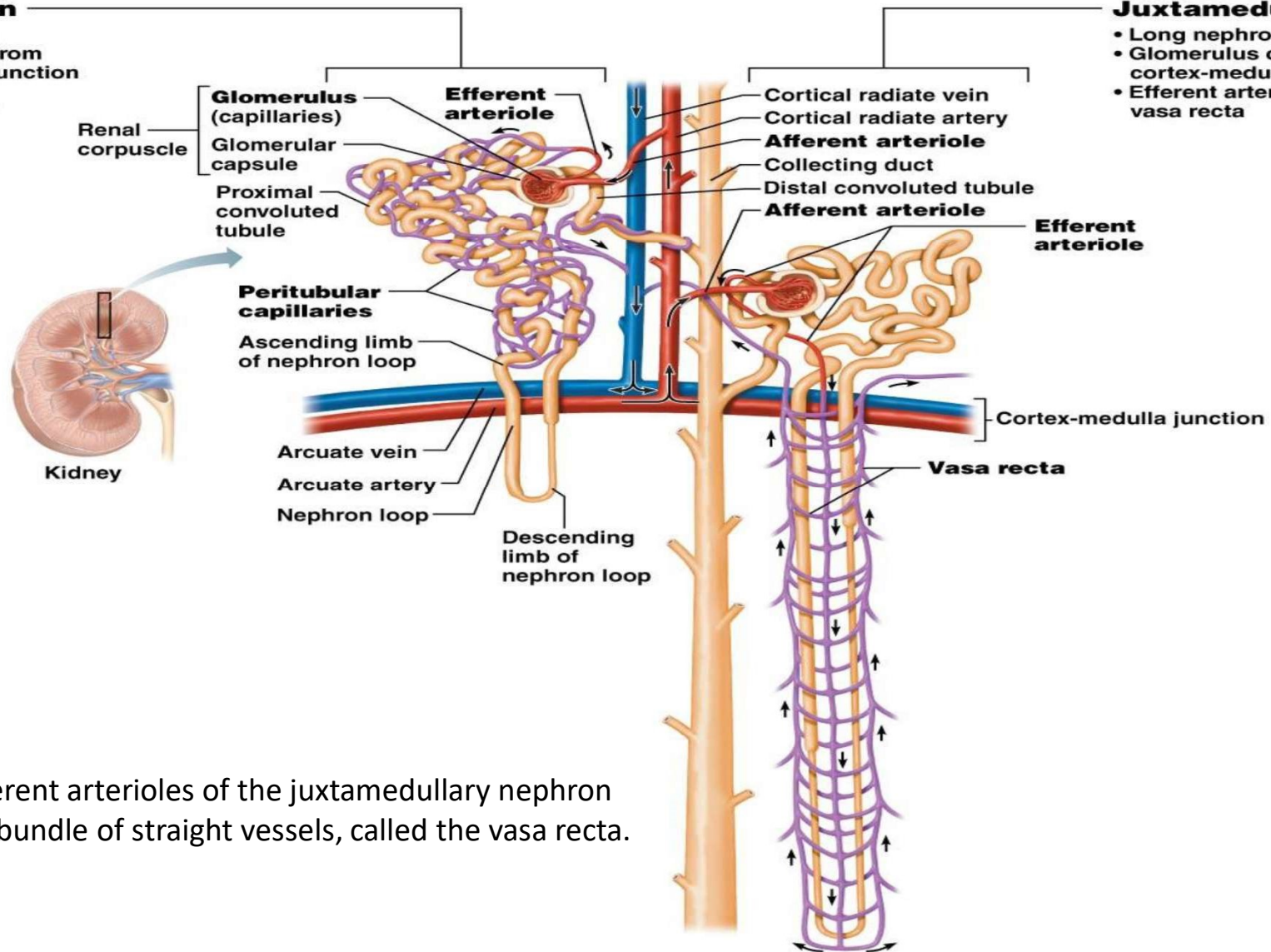
(b) Path of blood flow through renal blood vessels

Cortical nephron

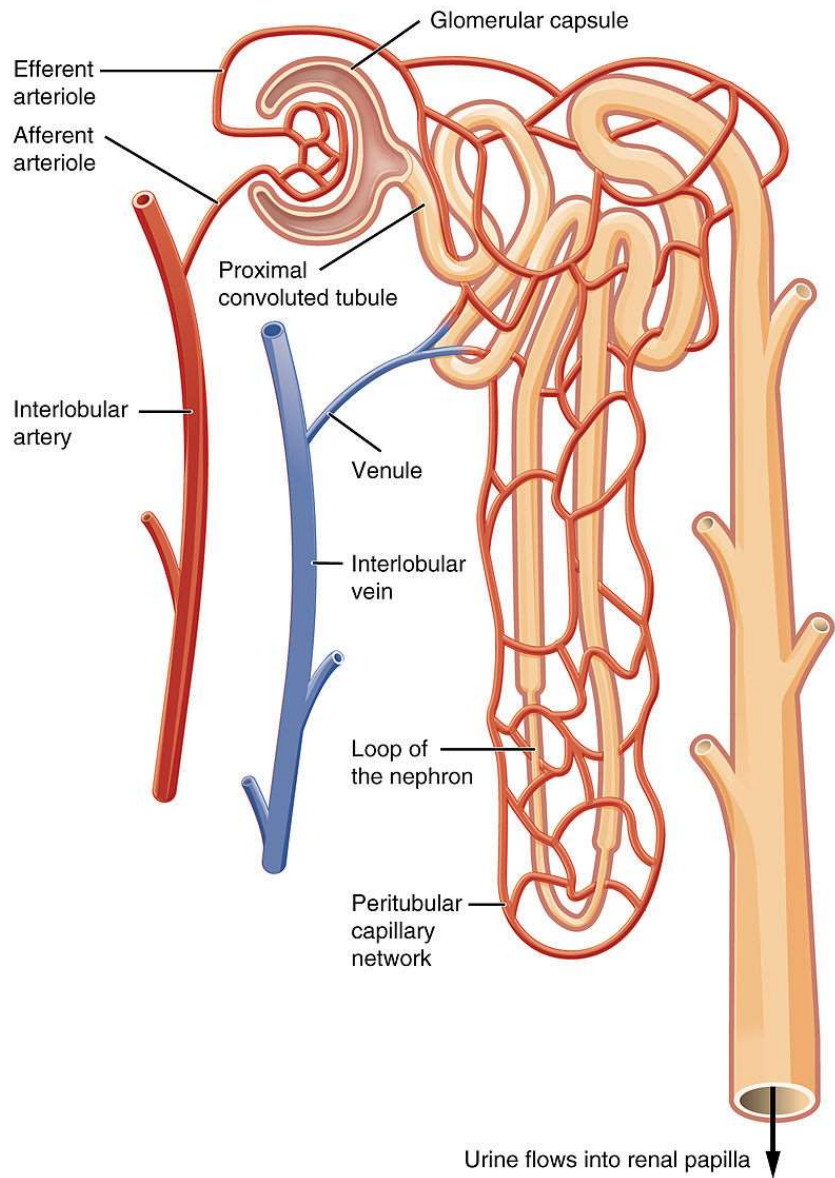
- Short nephron loop
- Glomerulus further from the cortex-medulla junction
- Efferent arteriole supplies peritubular capillaries

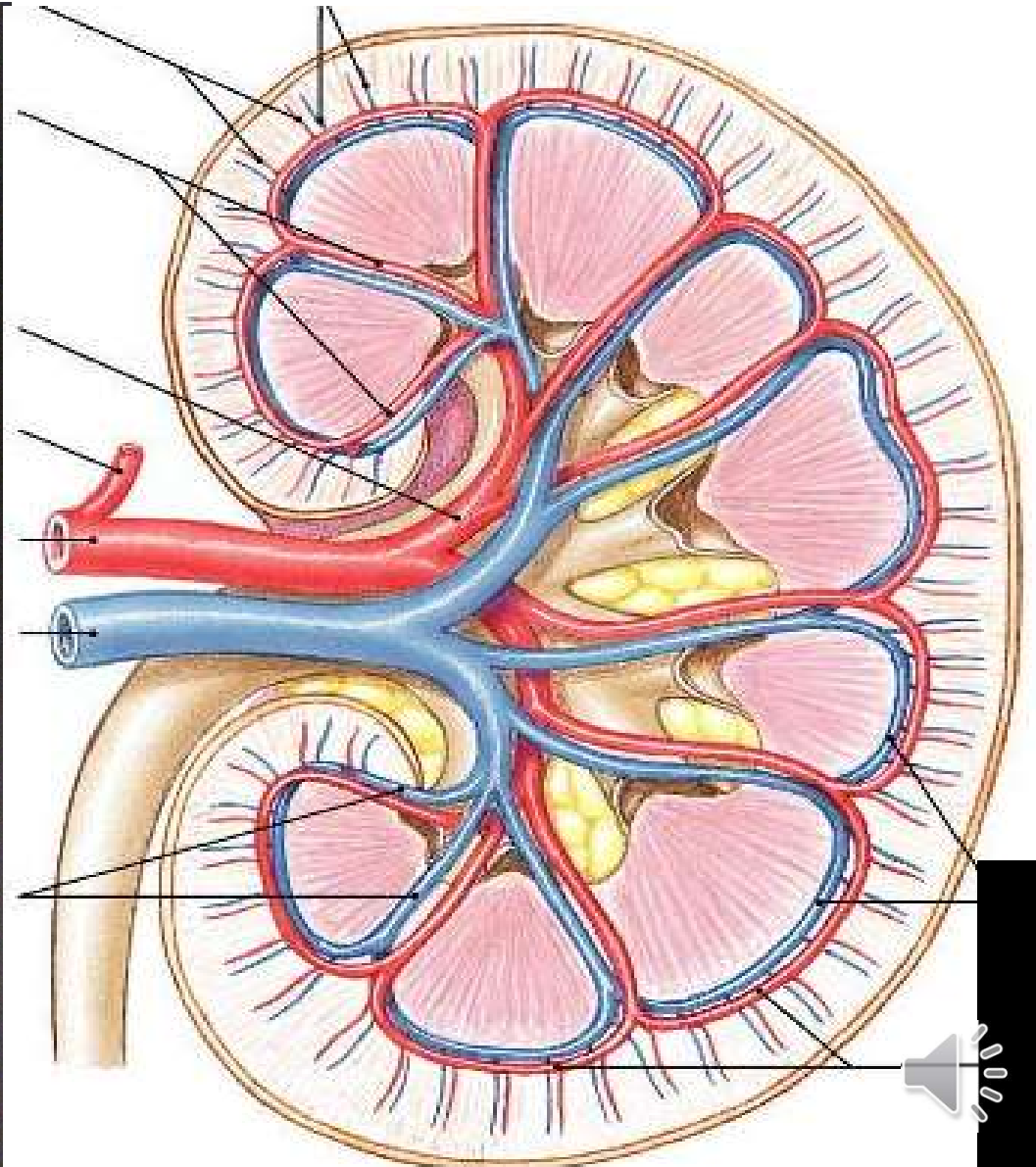
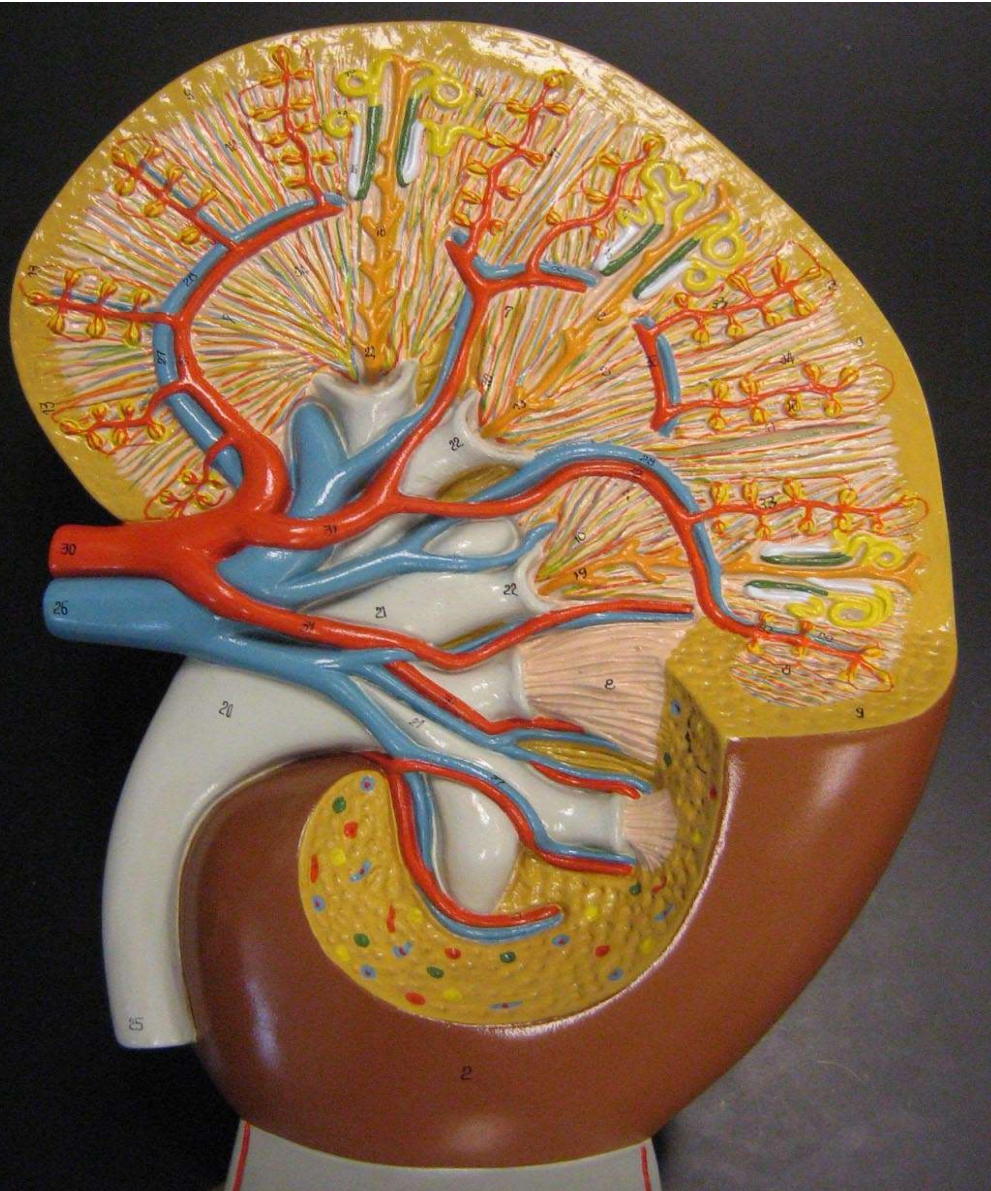
Juxtamedullary nephron

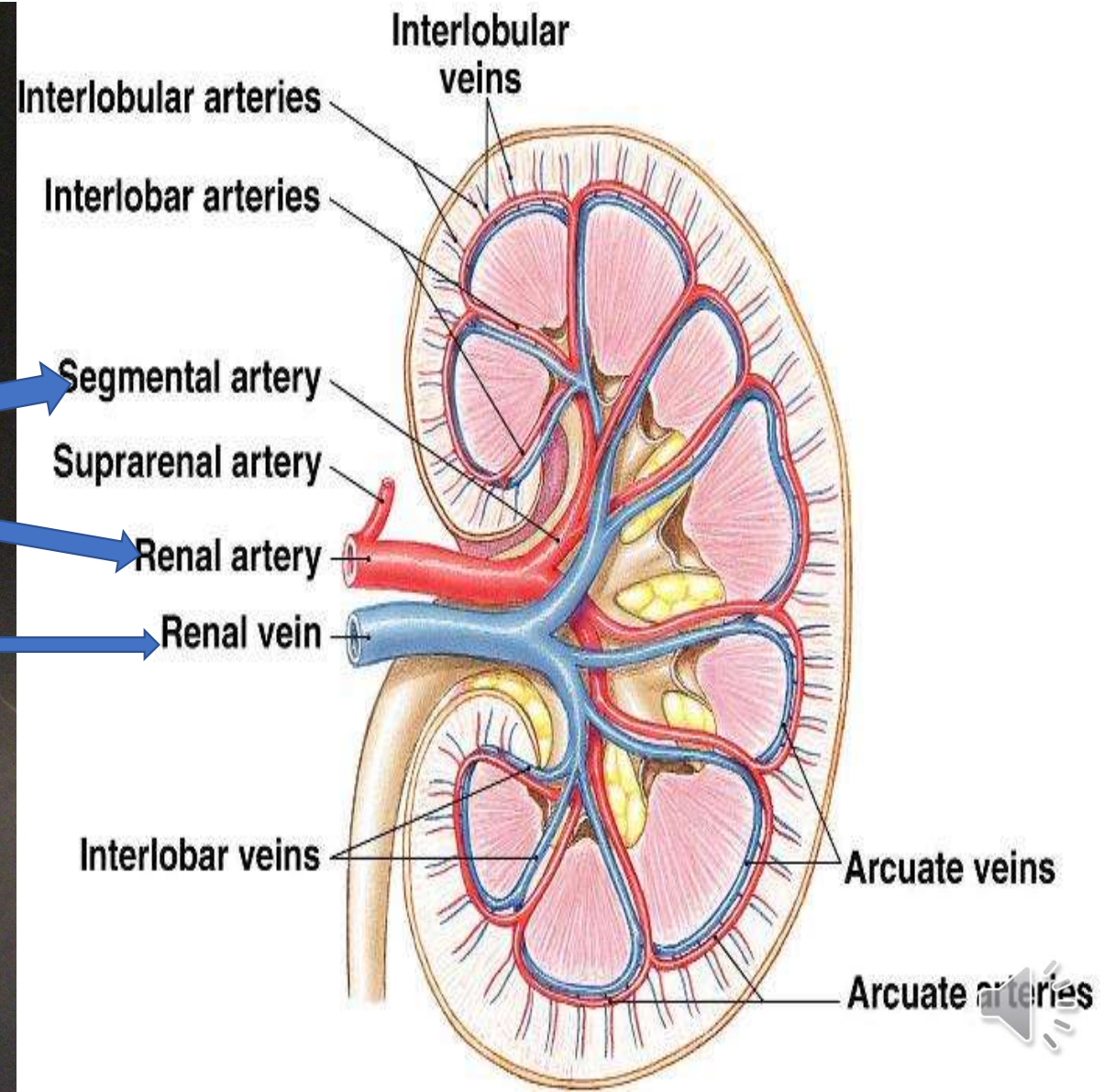
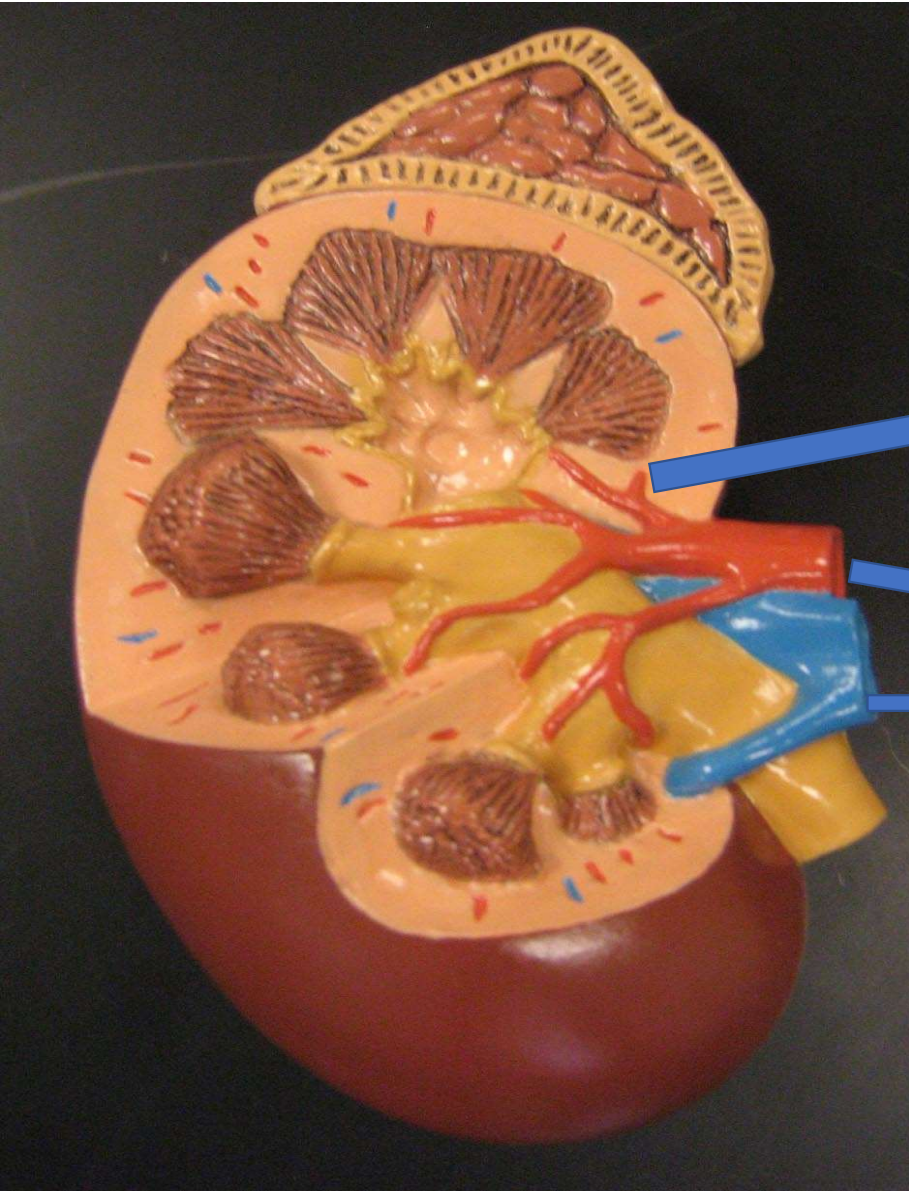
- Long nephron loop
- Glomerulus closer to the cortex-medulla junction
- Efferent arteriole supplies vasa recta

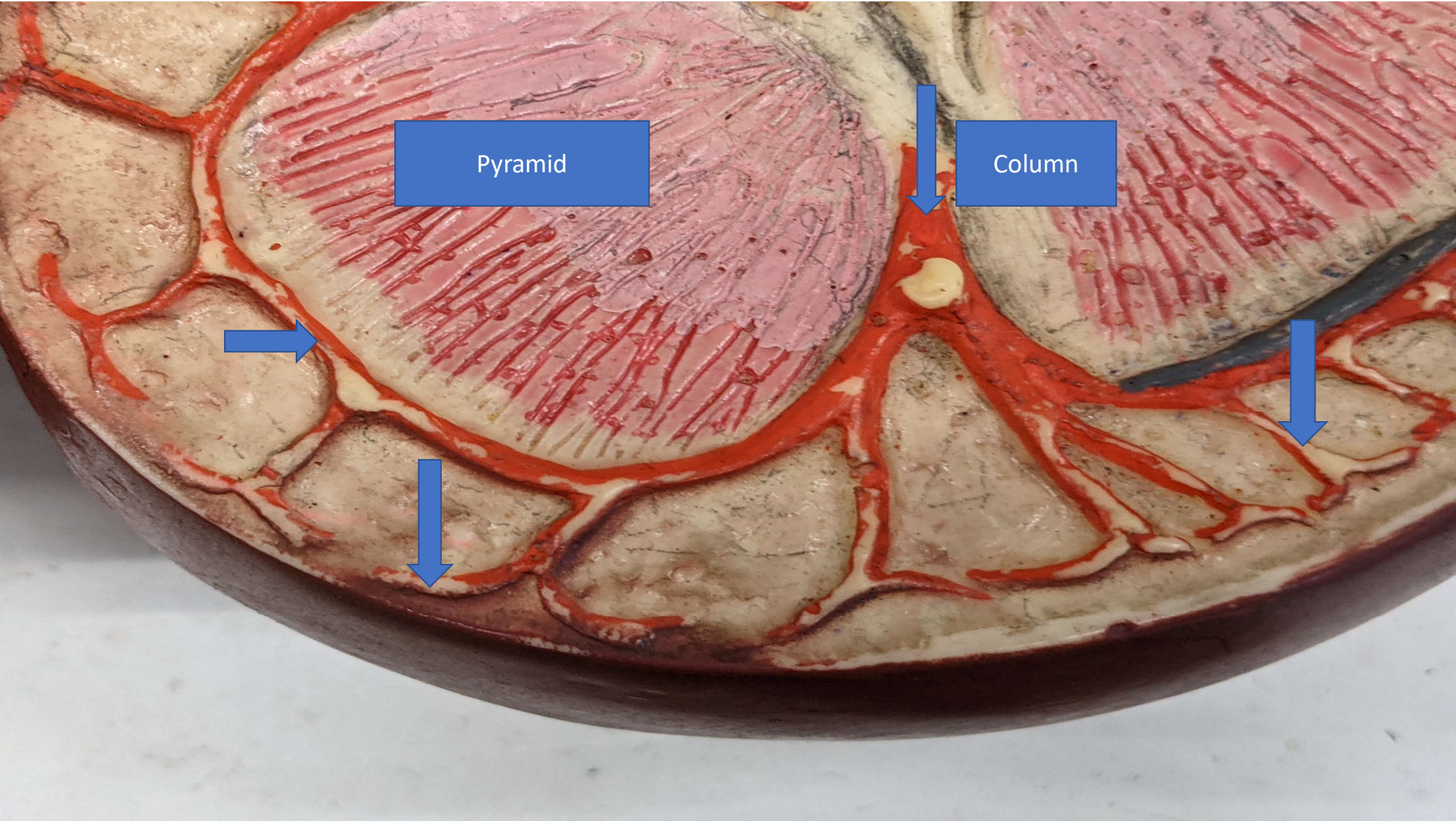


Vasa recta: efferent arterioles of the juxtamedullary nephron form a unique bundle of straight vessels, called the vasa recta.



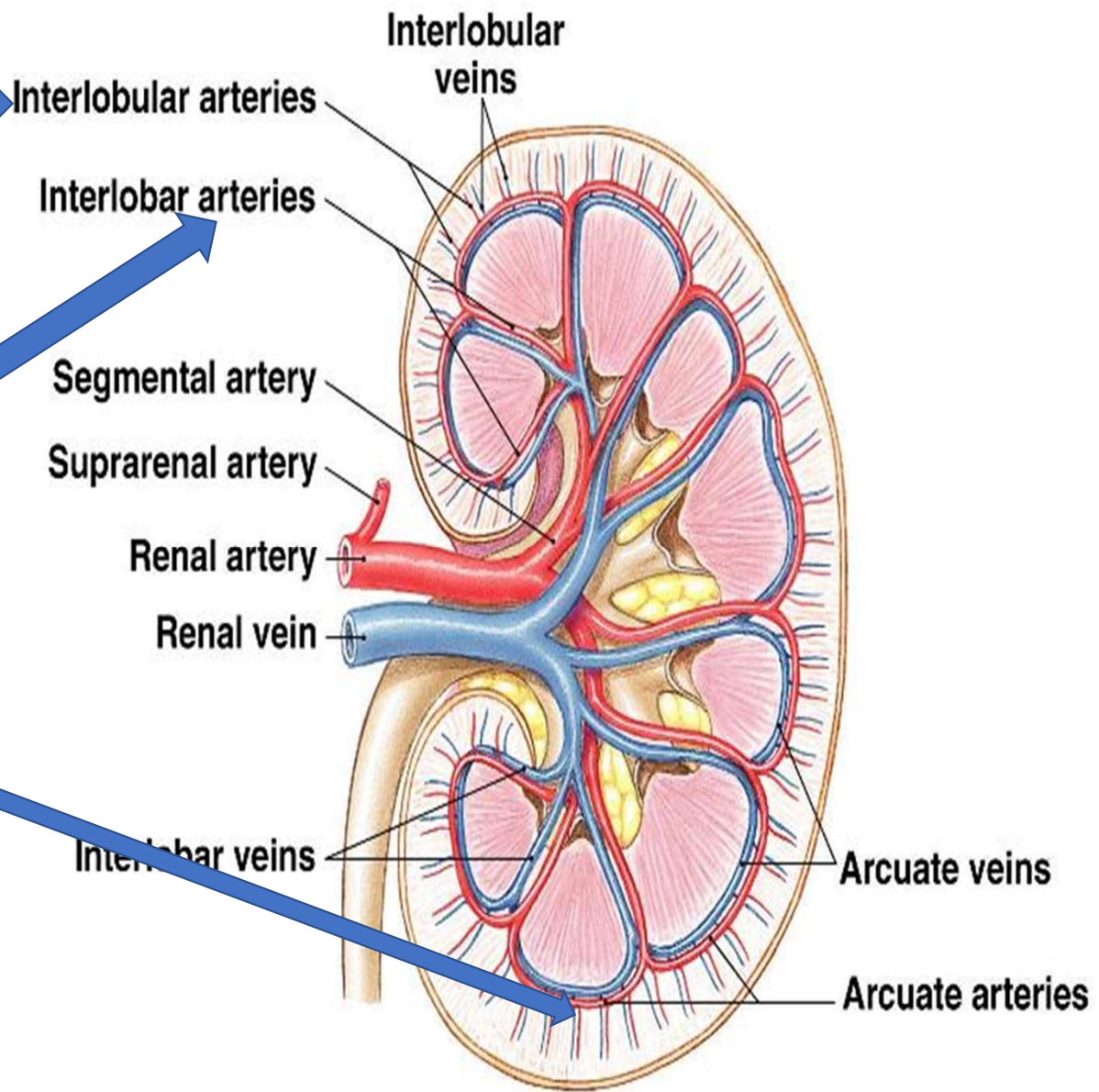
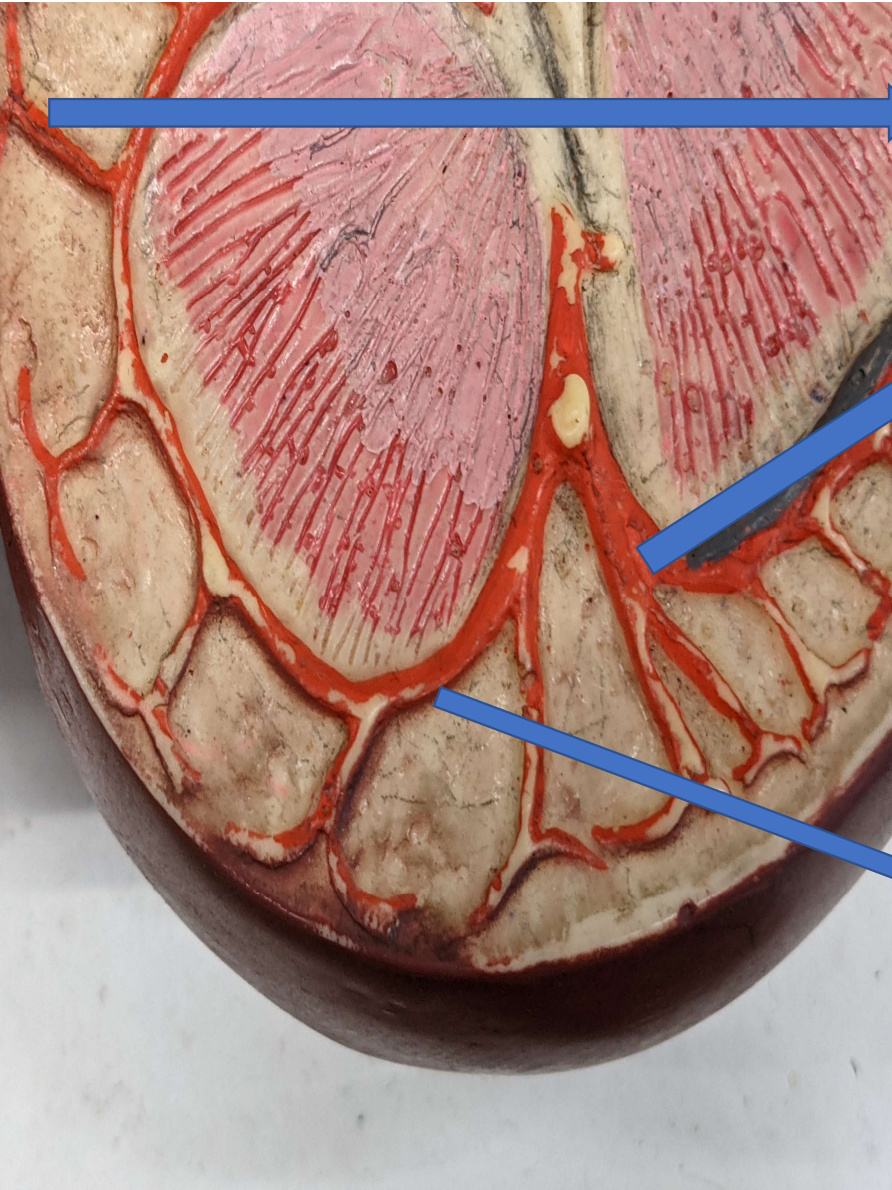


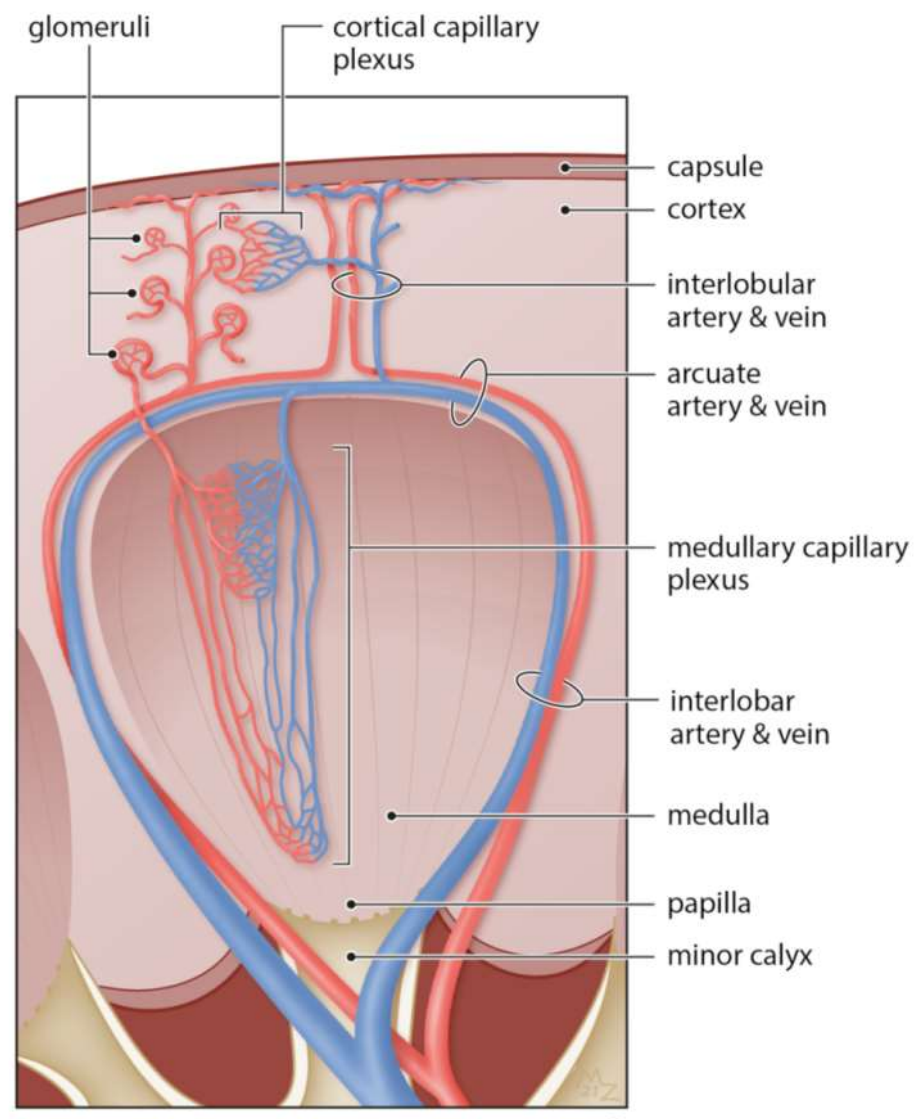
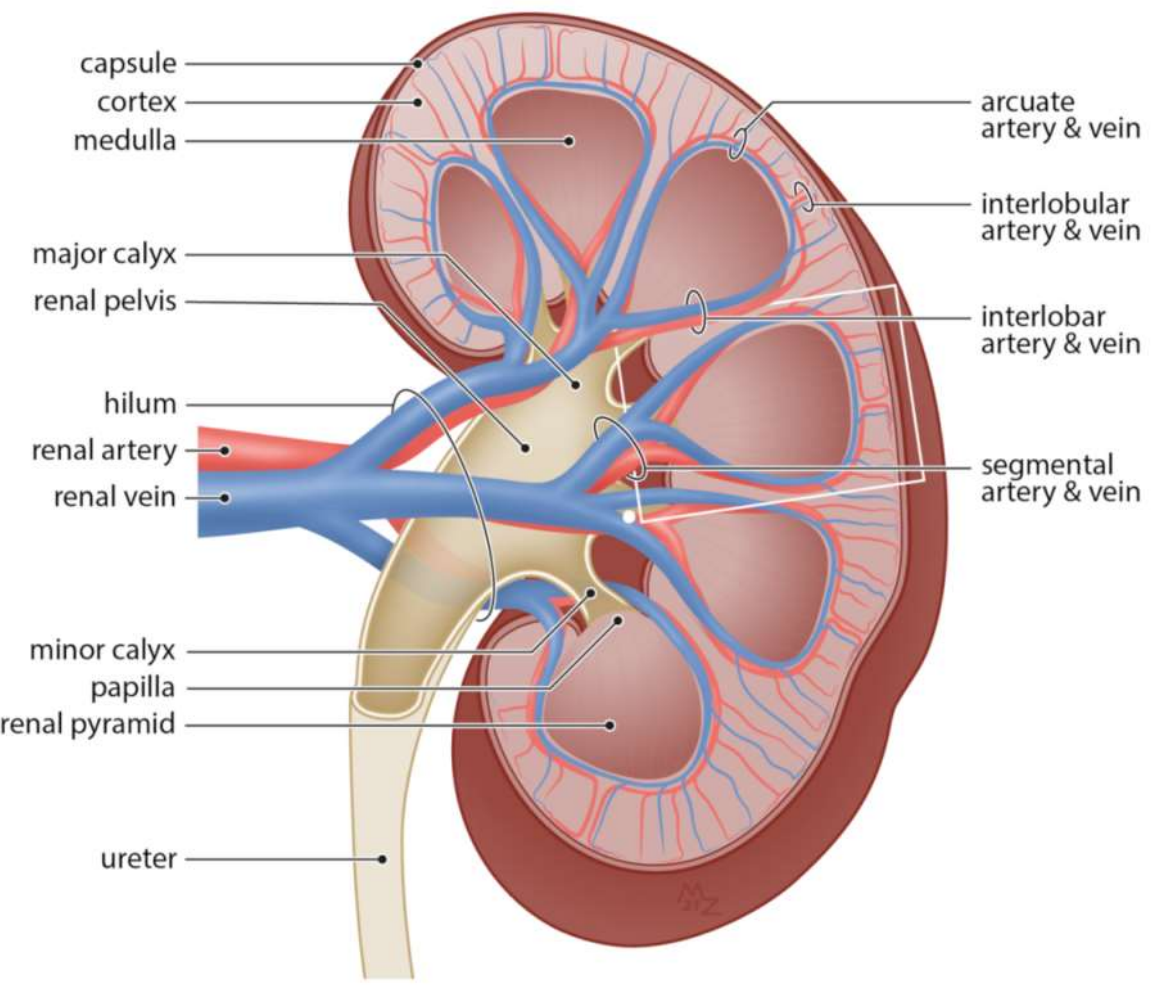




Pyramid

Column





Composition of Urine?

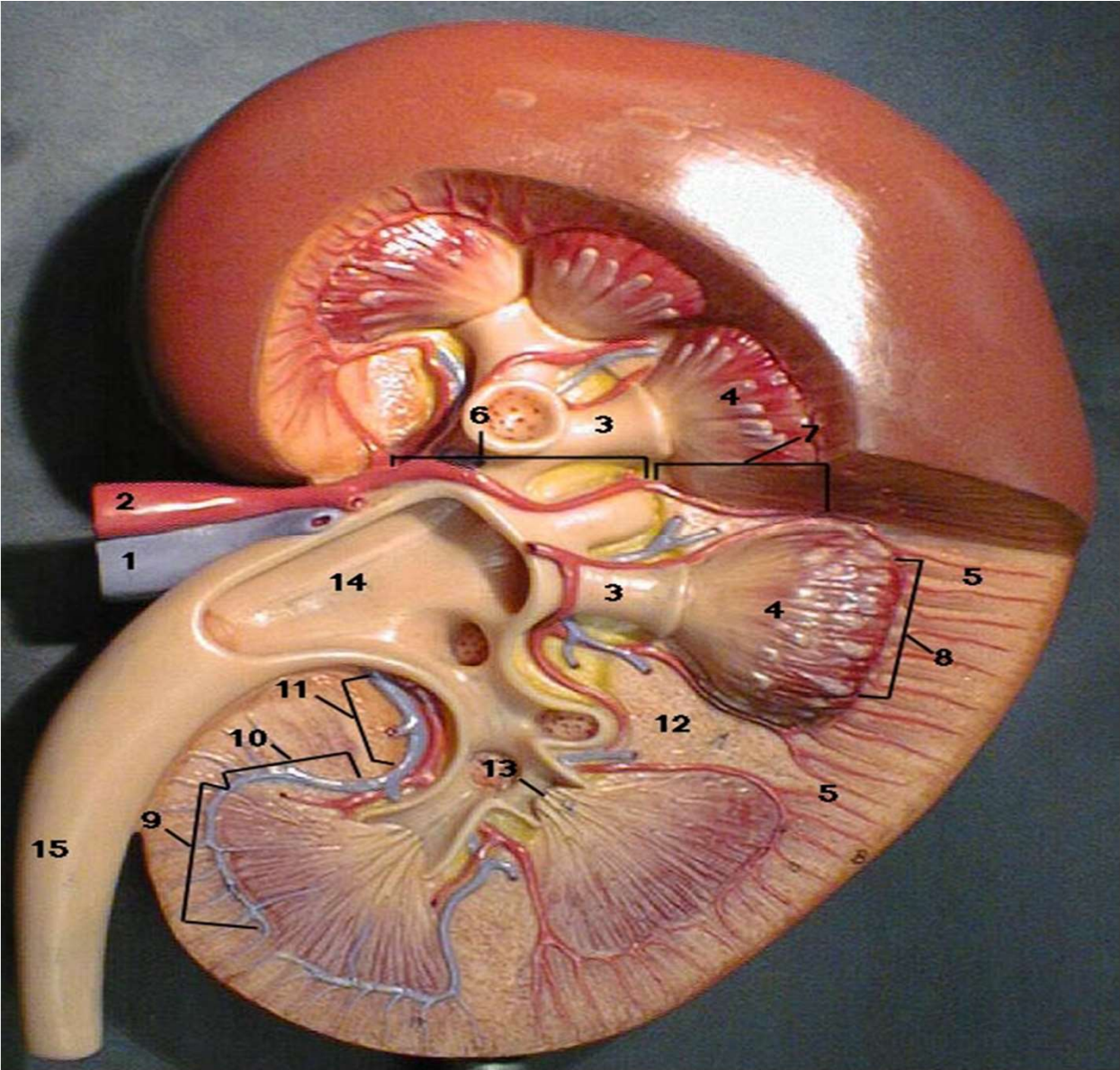
–**transparency** is clear, indicating the lack of large solutes such as plasma proteins or blood cells [can be influenced by bacterial metabolism in older urine samples].

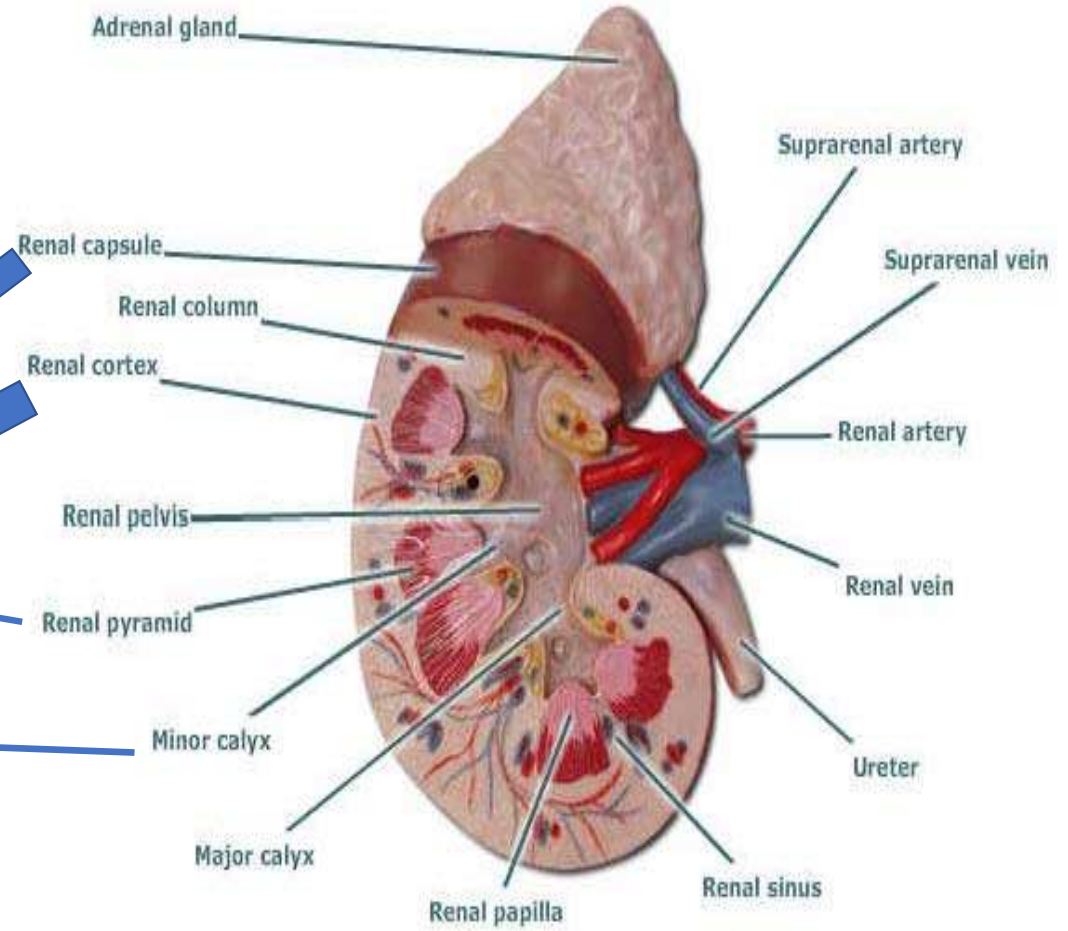
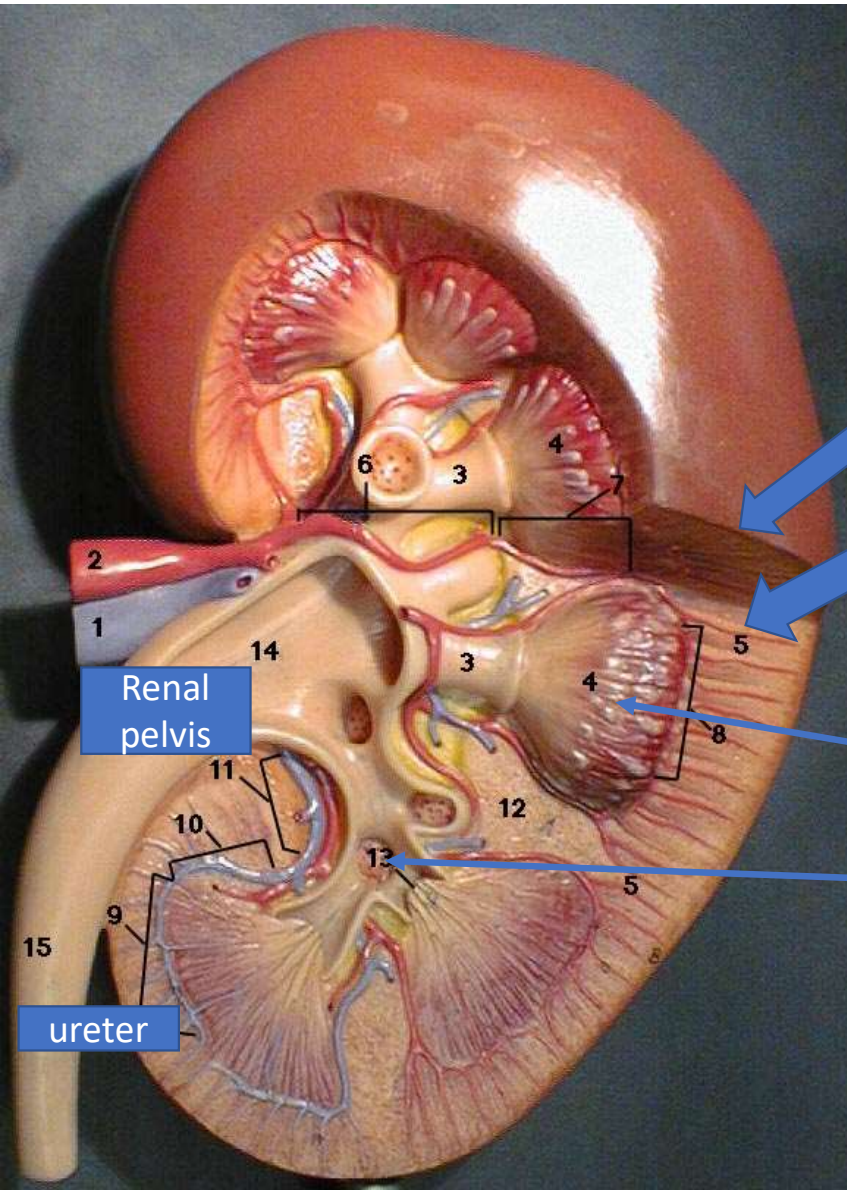
–**Color** is from light yellow to amber, due to urochrome pigments as byproduct of bile metabolism [can be influenced by food, menstrual bleeding, and metabolic products].

–**Odor** is from aromatic to slightly ammonia – like, due to the nitrogenous wastes in urine [can be influenced by disorders such as diabetes, or by food such as garlic, and by drugs].

–**pH** is from 4.6 to 8.0 with an average of 6.0, due to H^+ in the urine [strongly influenced by diet where protein cause acidic urine, and vegetables and wheat cause alkaline urine].

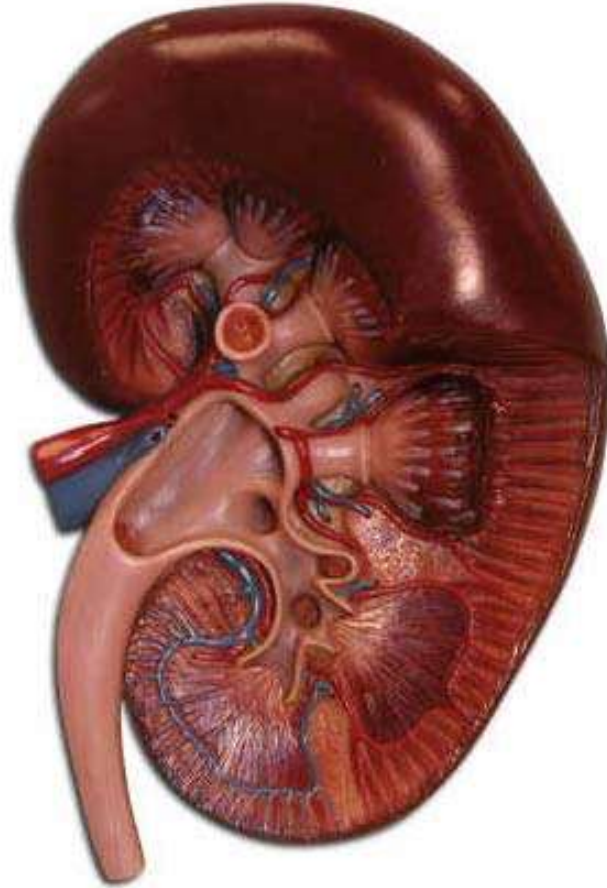
–**Specific gravity** (a measurement of dissolved solutes in a solution) is from 1.001 to 1.035, due to the 5% solute composition in normal urine.



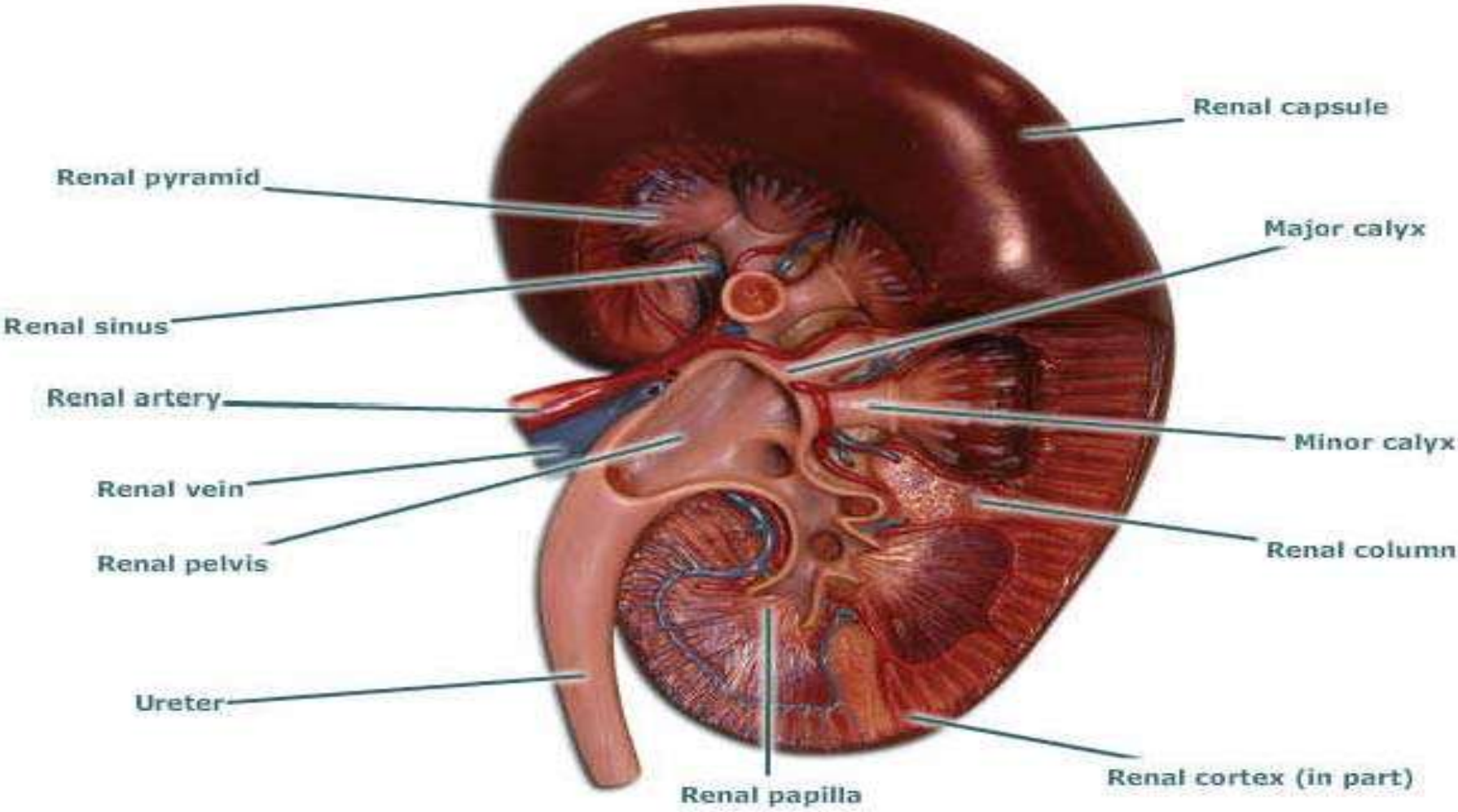


LT K12, Kidney with Adrenal Gland, 2 part, 3D Scientific®

Kidney

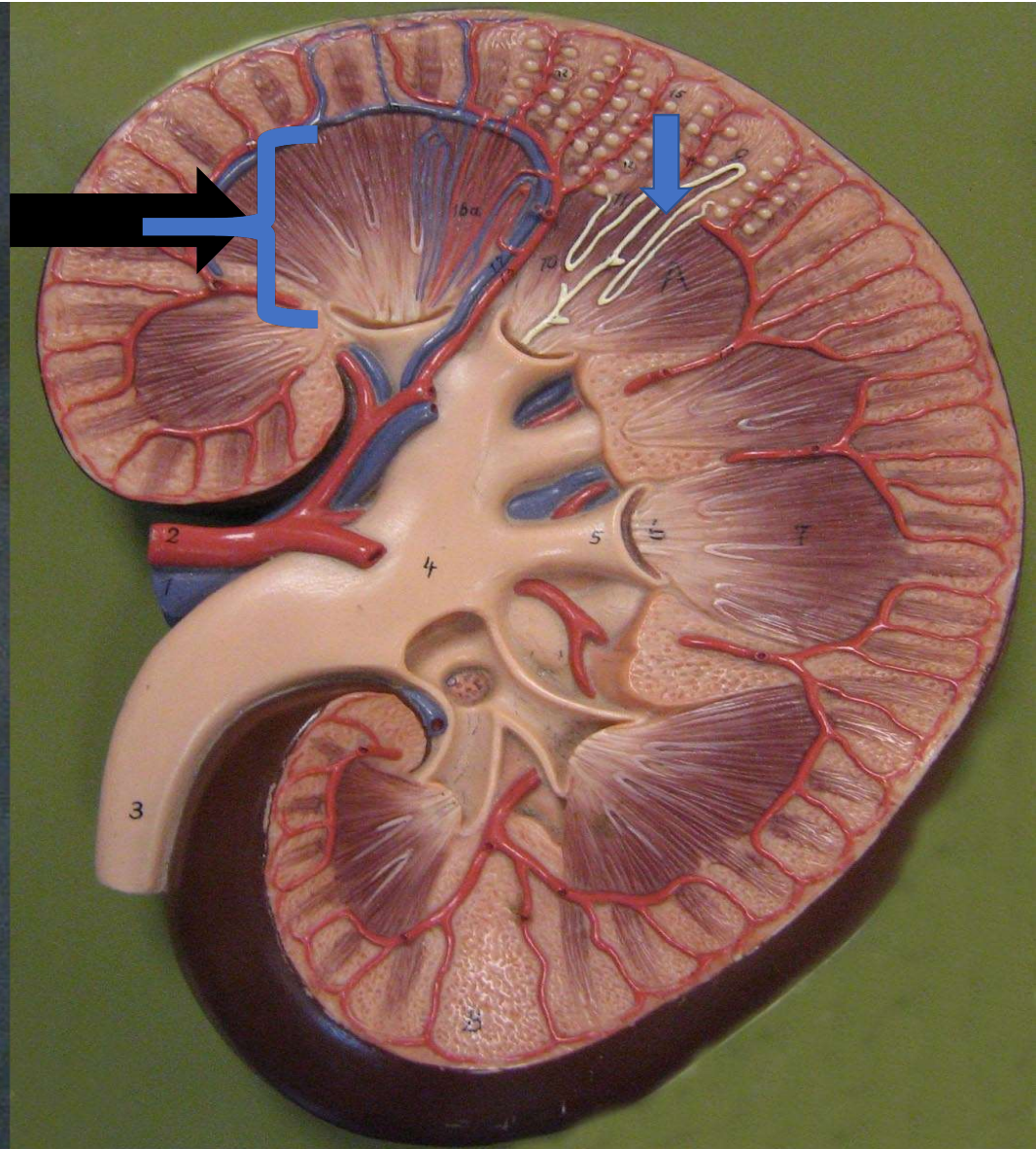
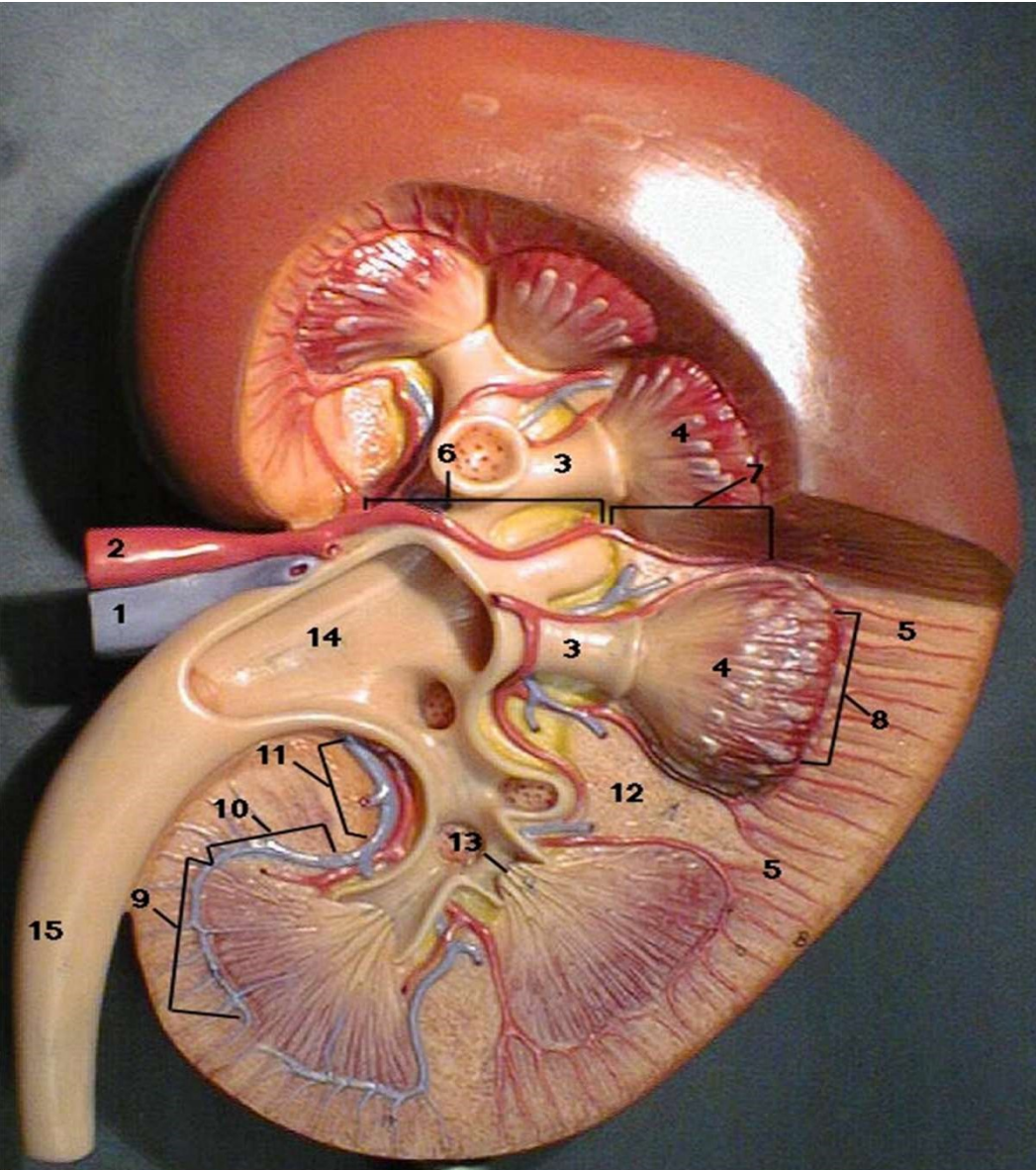


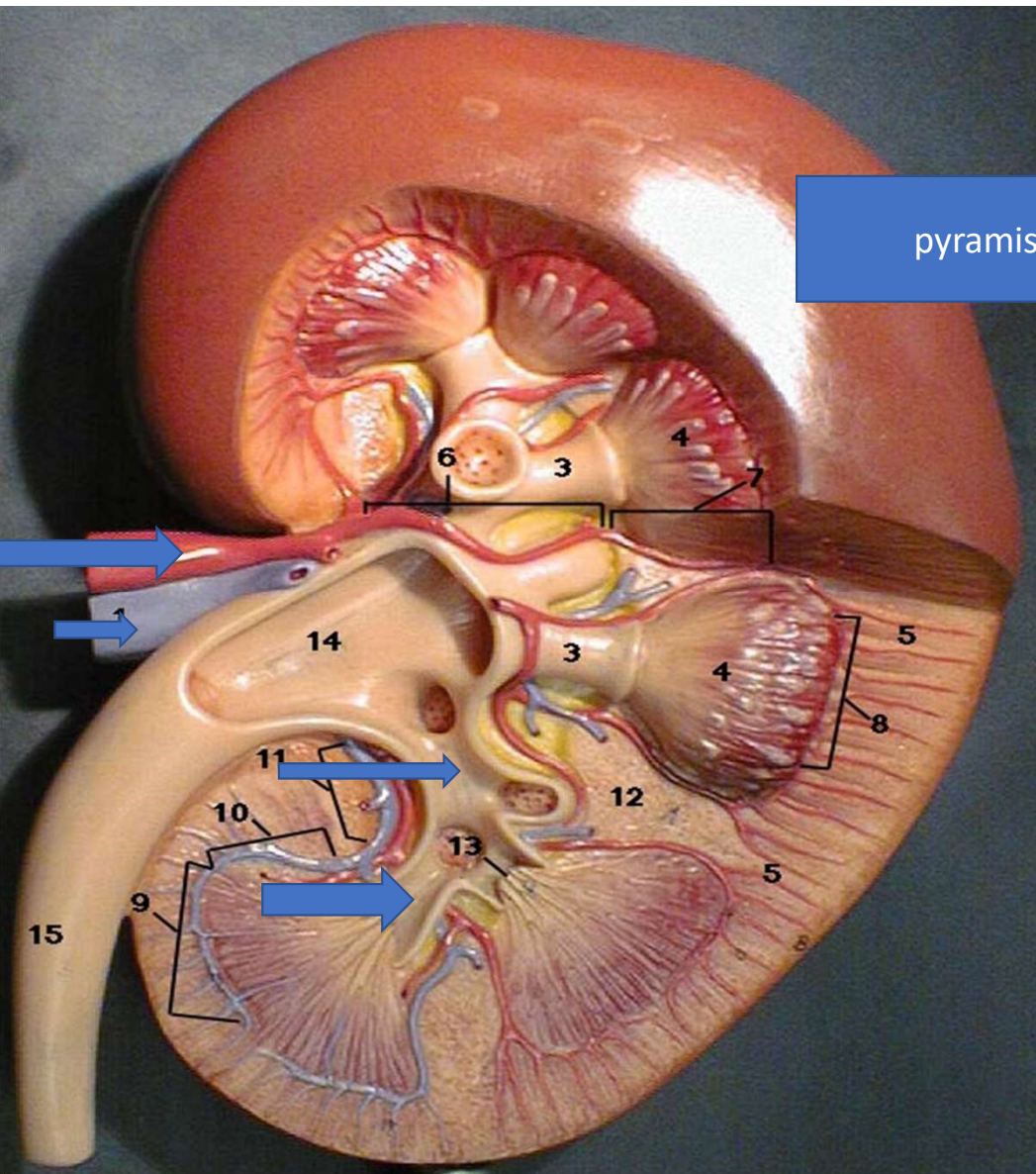
Kidney



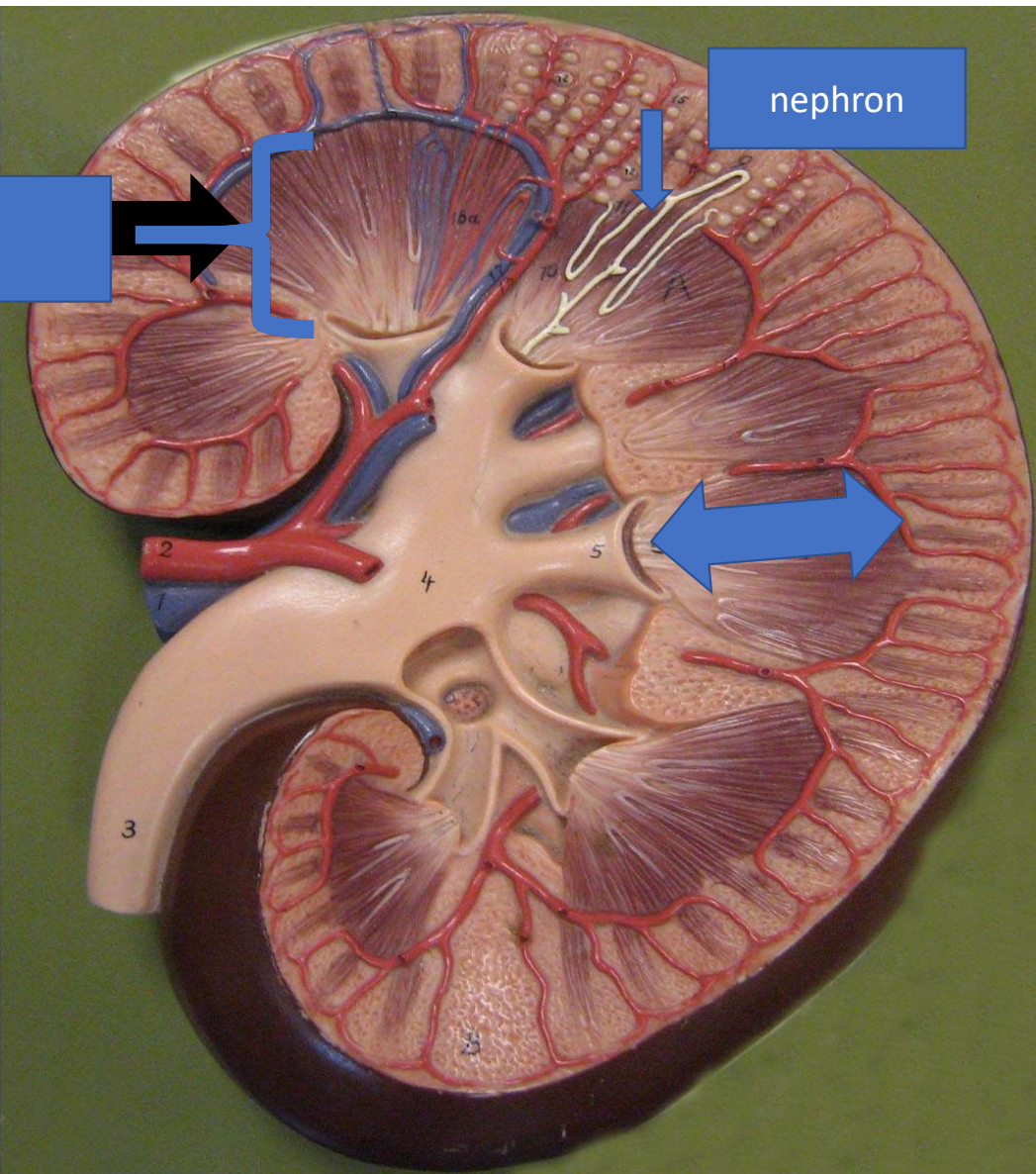
The normal discharge of urine, wherein it is voluntarily discharged from the body; another word or normal urination.

Micturition

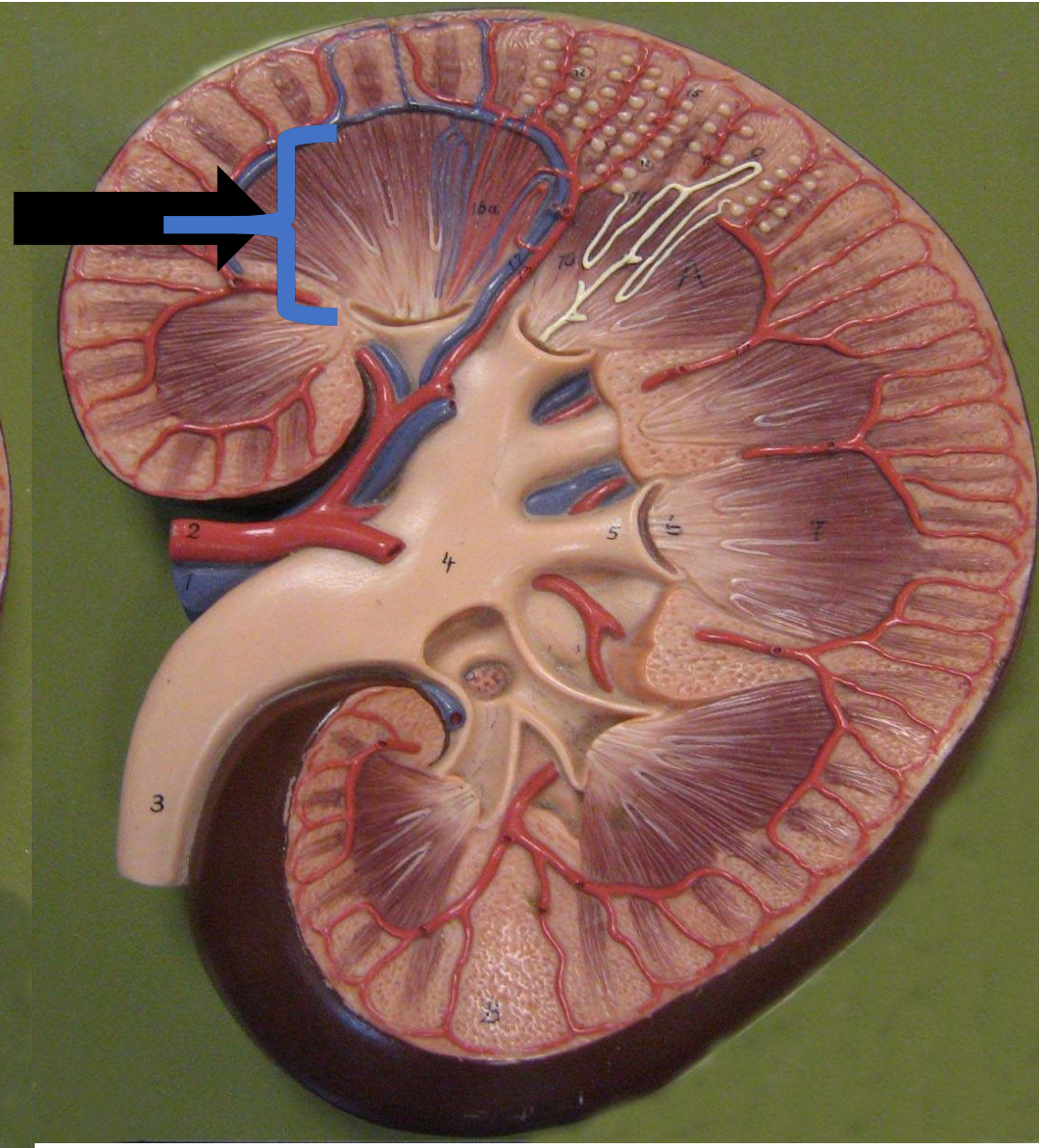
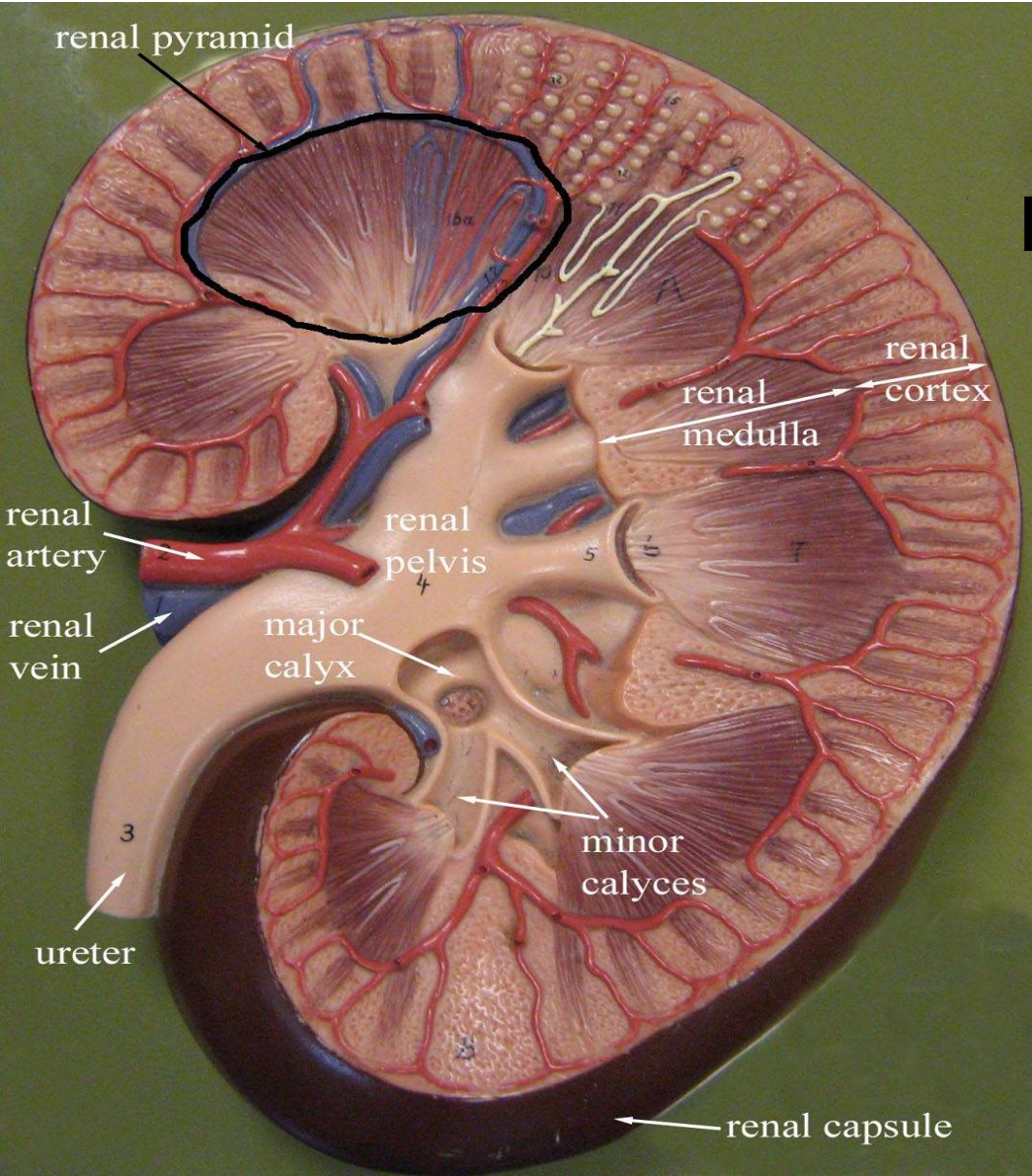


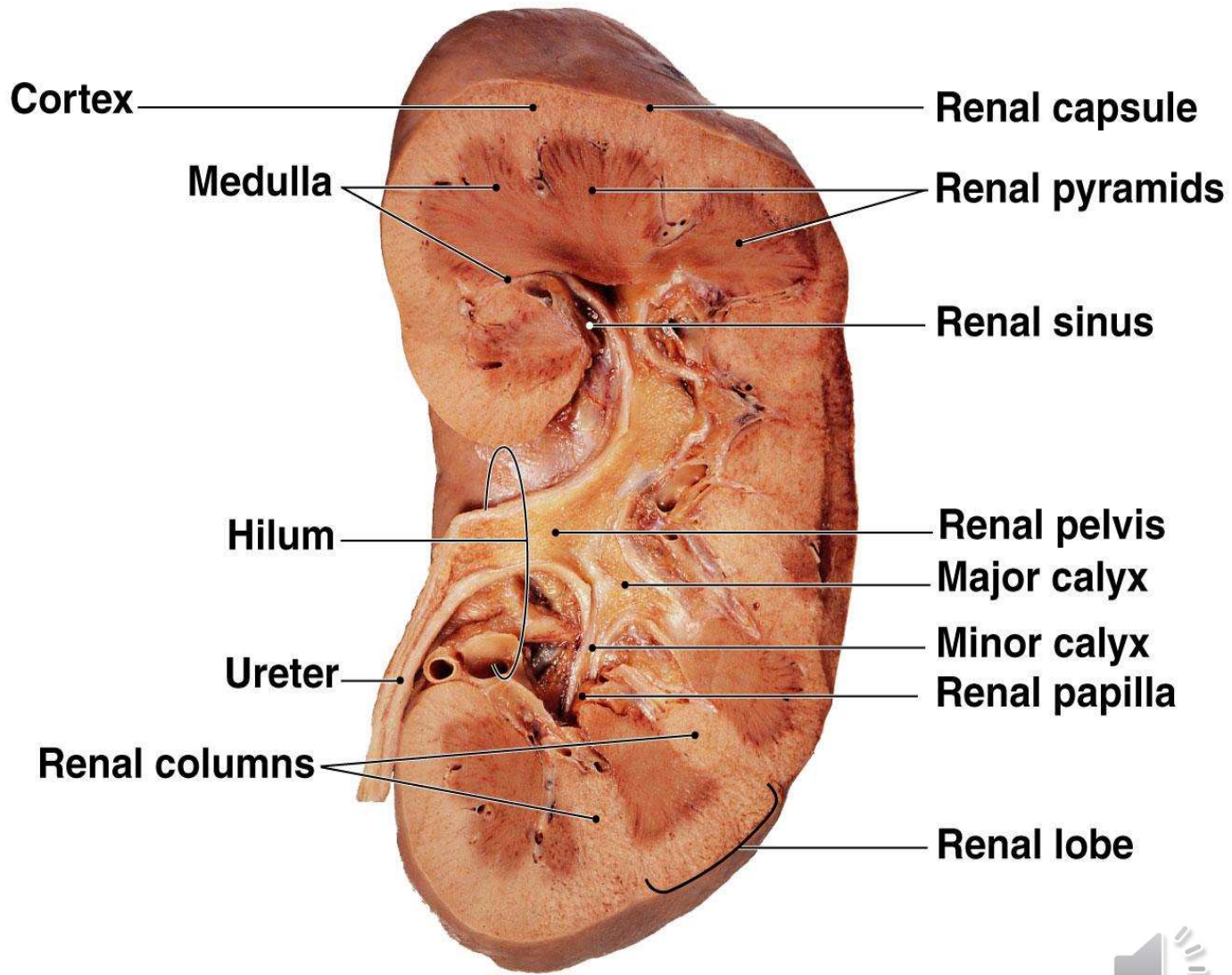
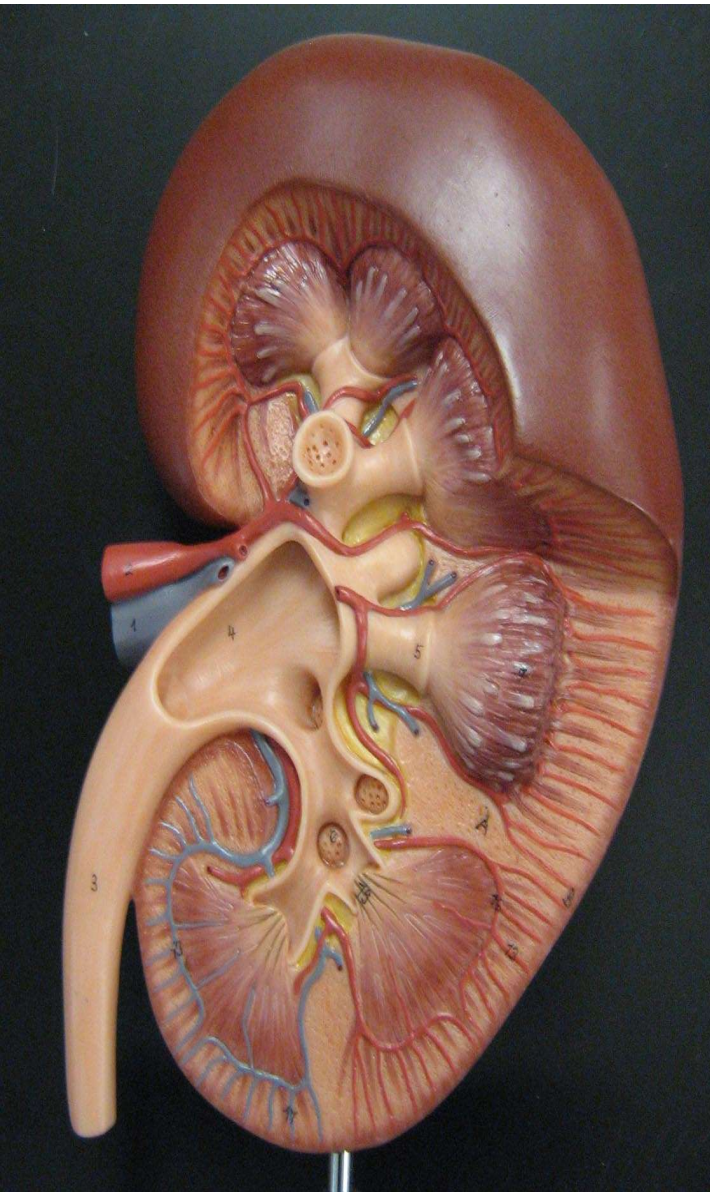


pyramis



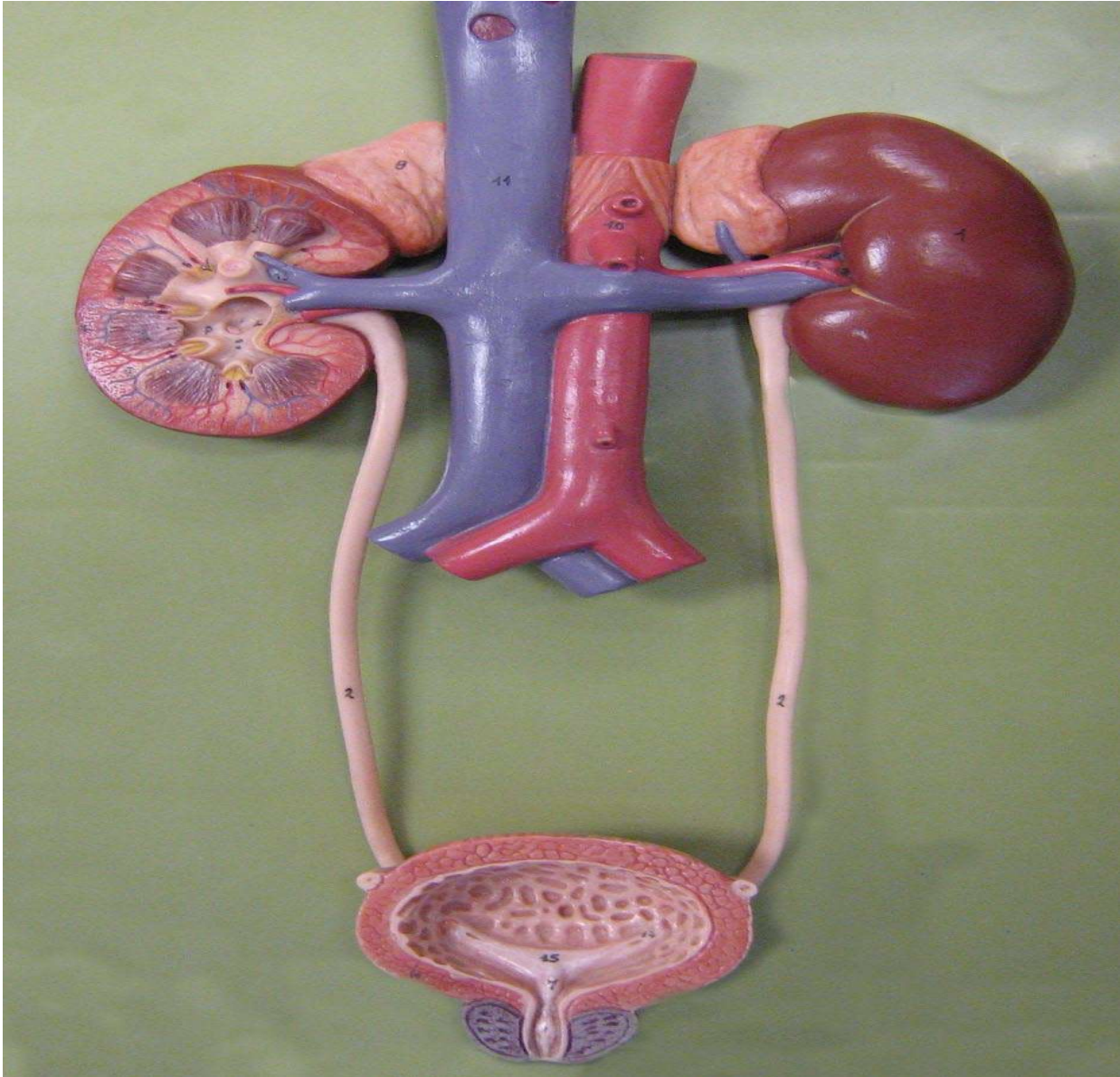
nephron

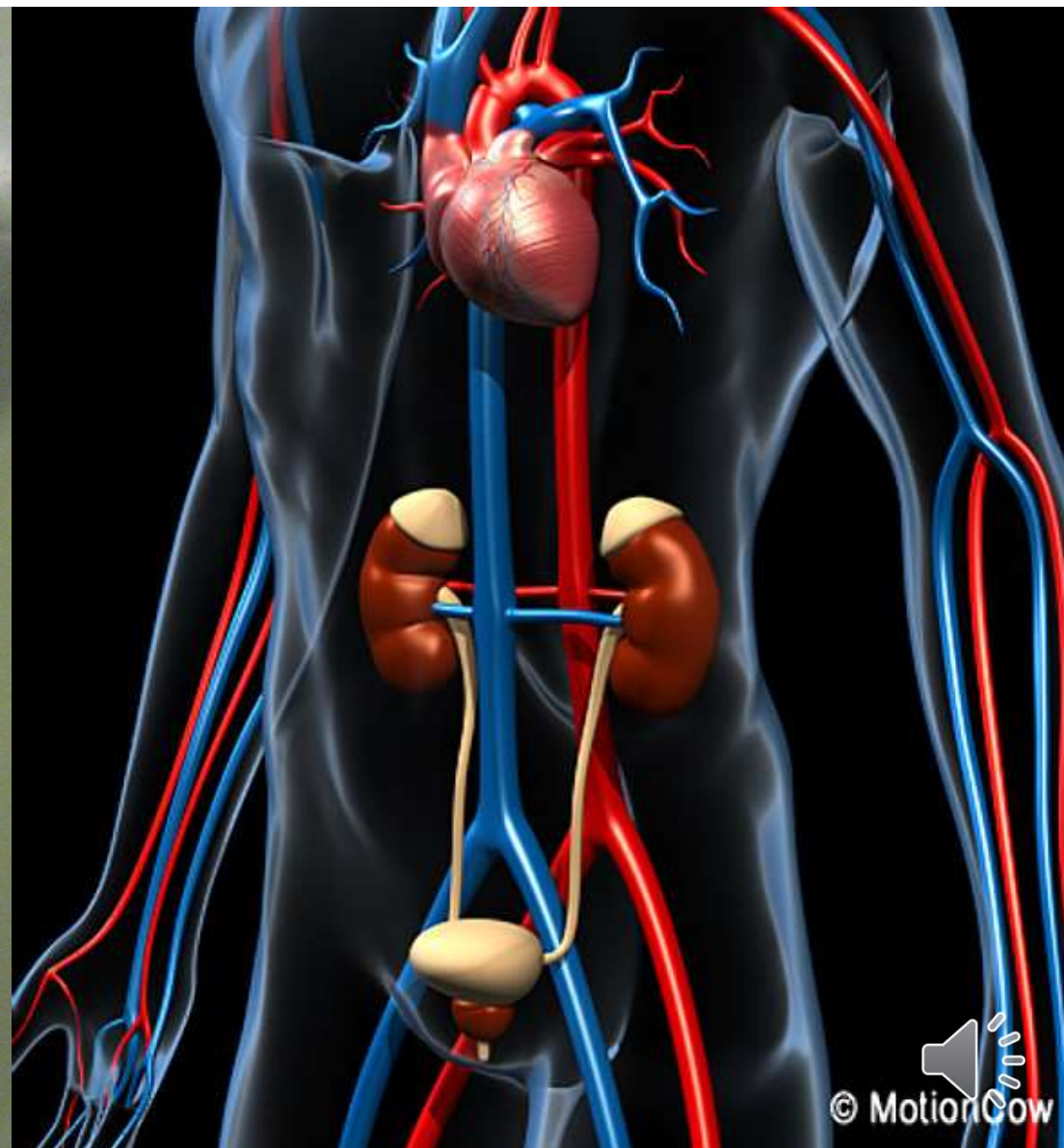
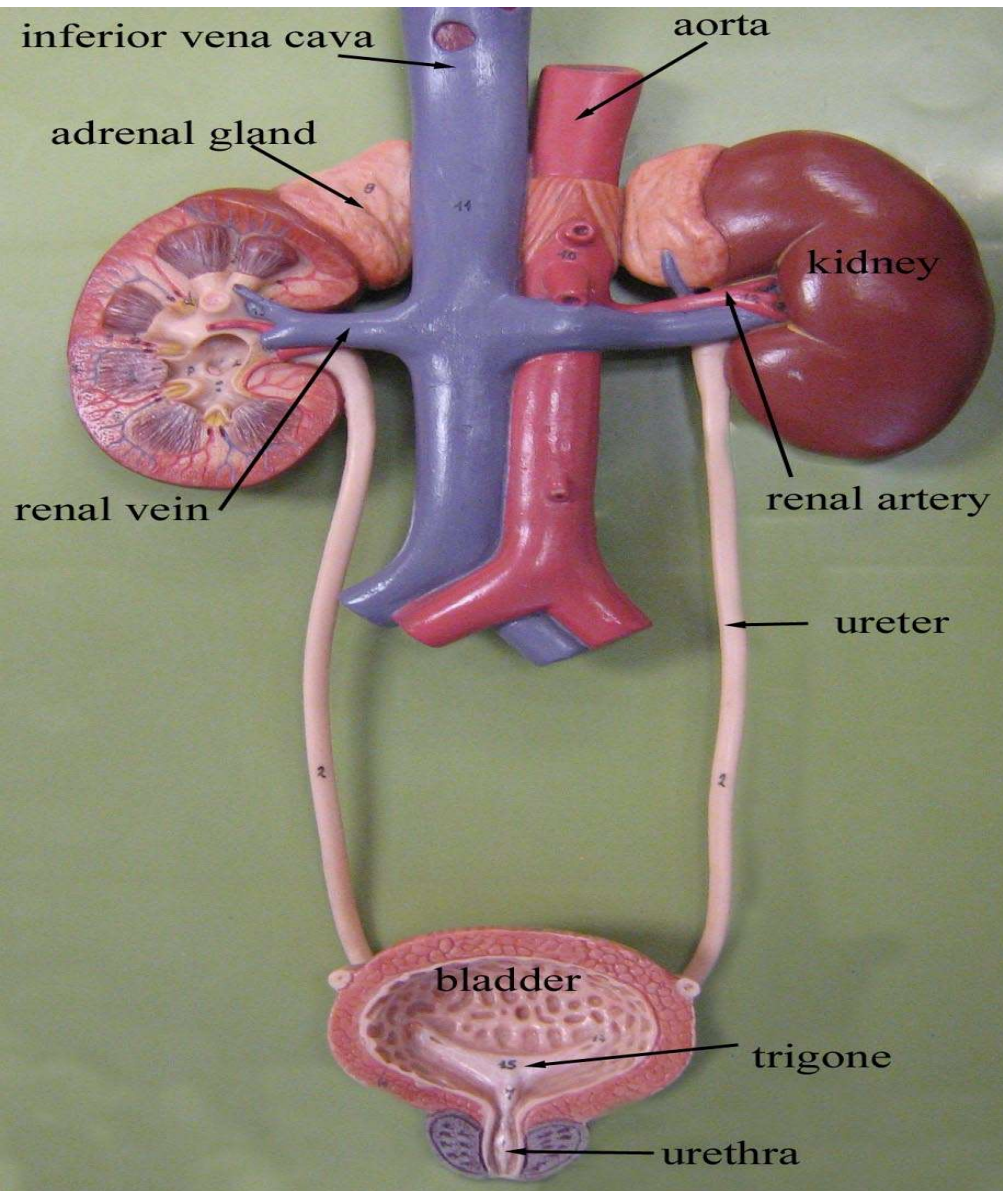




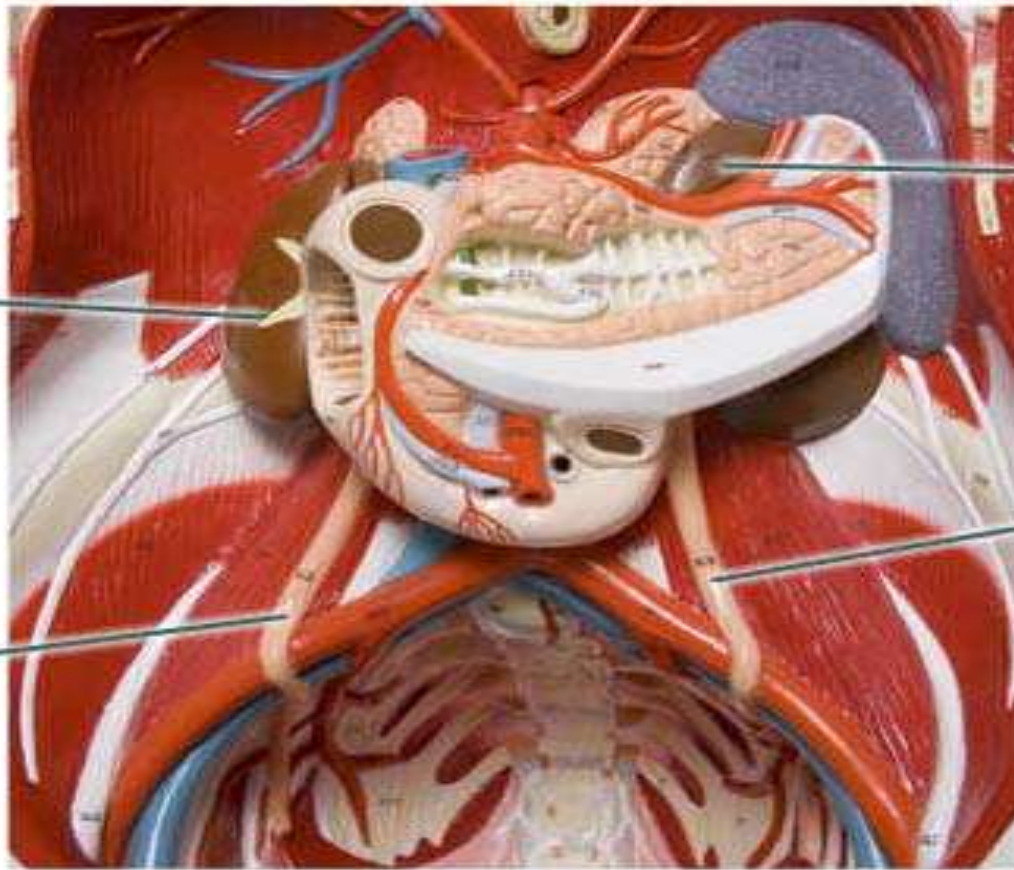
(b)



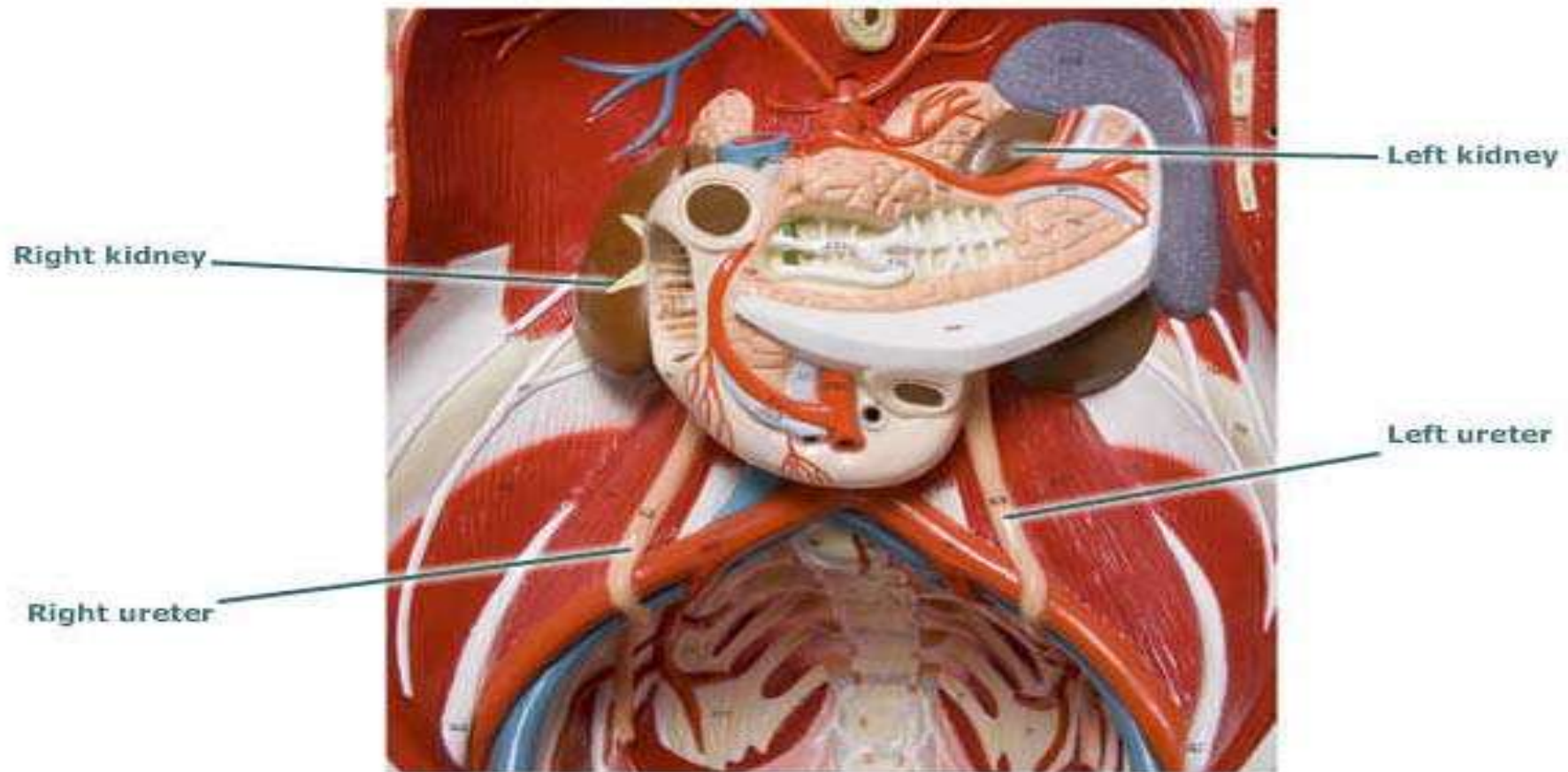




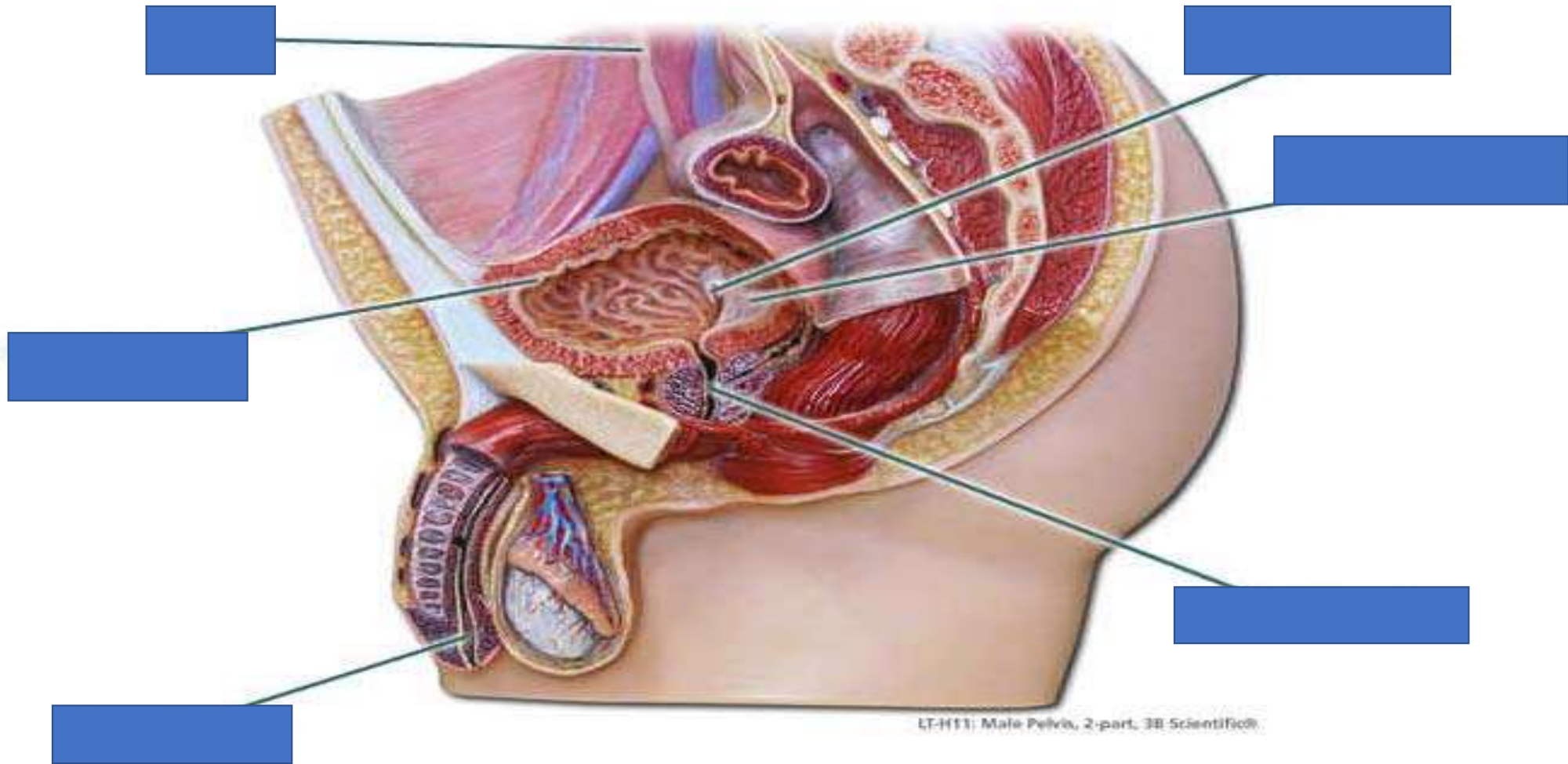
Abdomen, anterior view



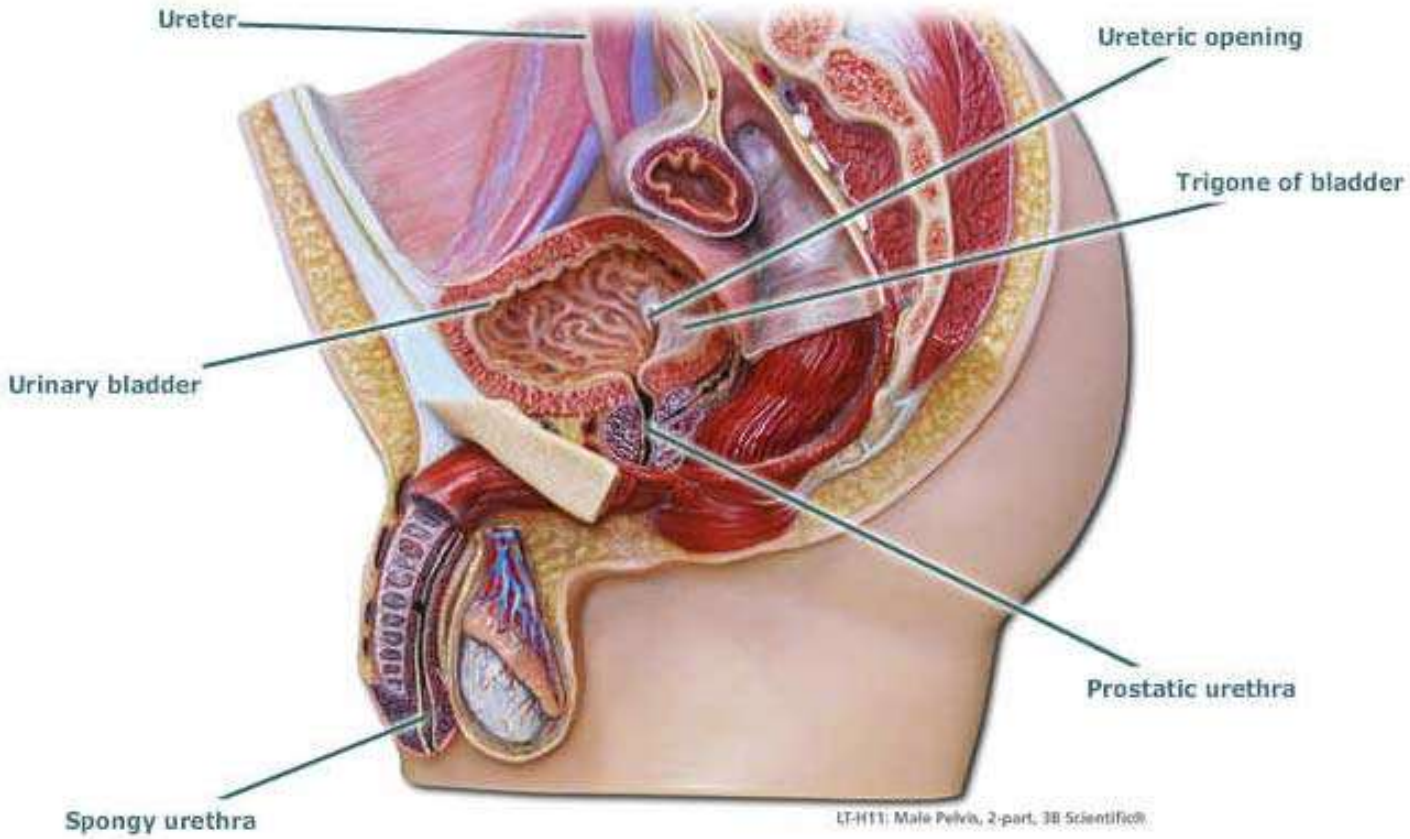
Abdomen, anterior view



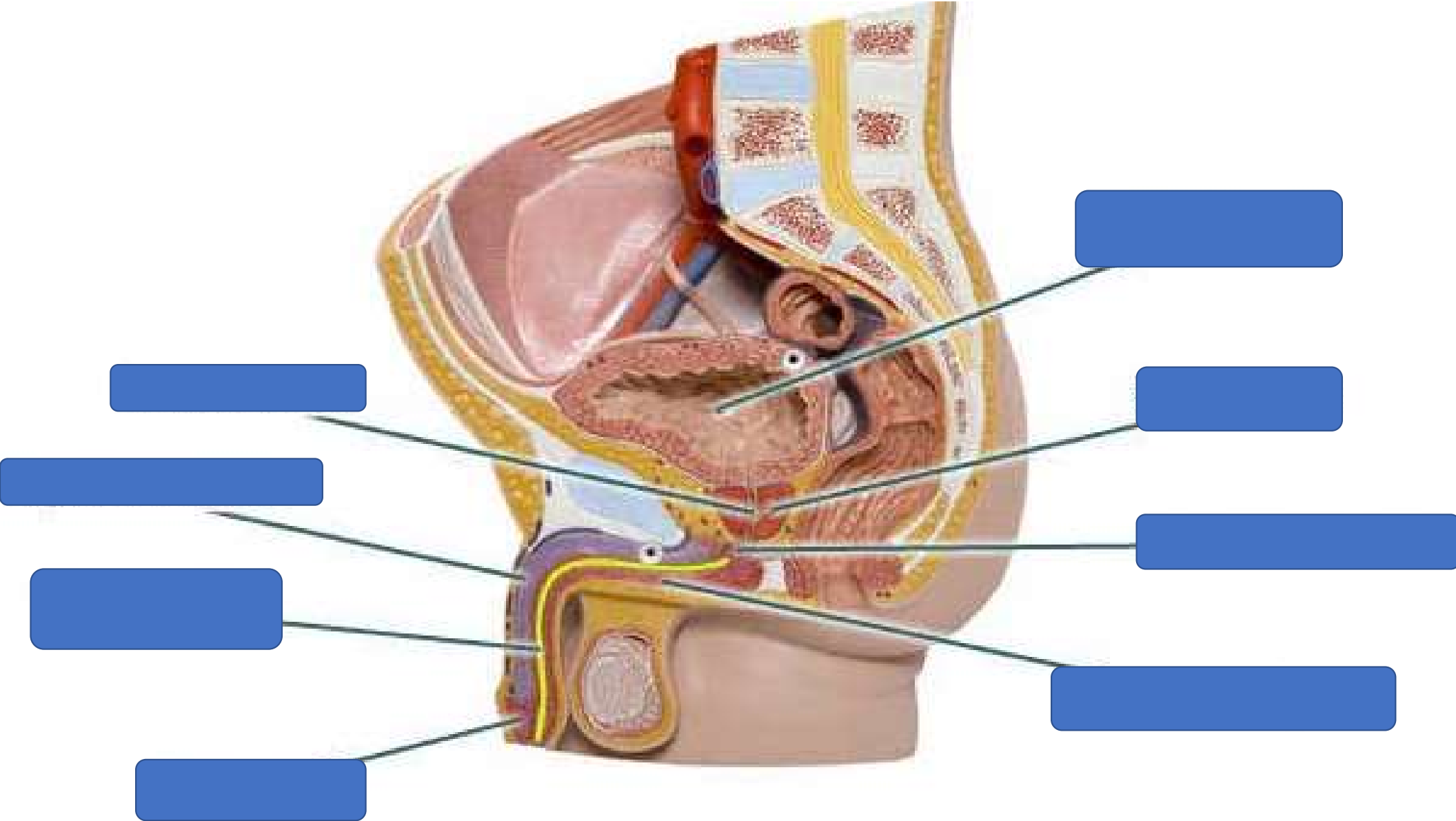
Lower urinary system of the male



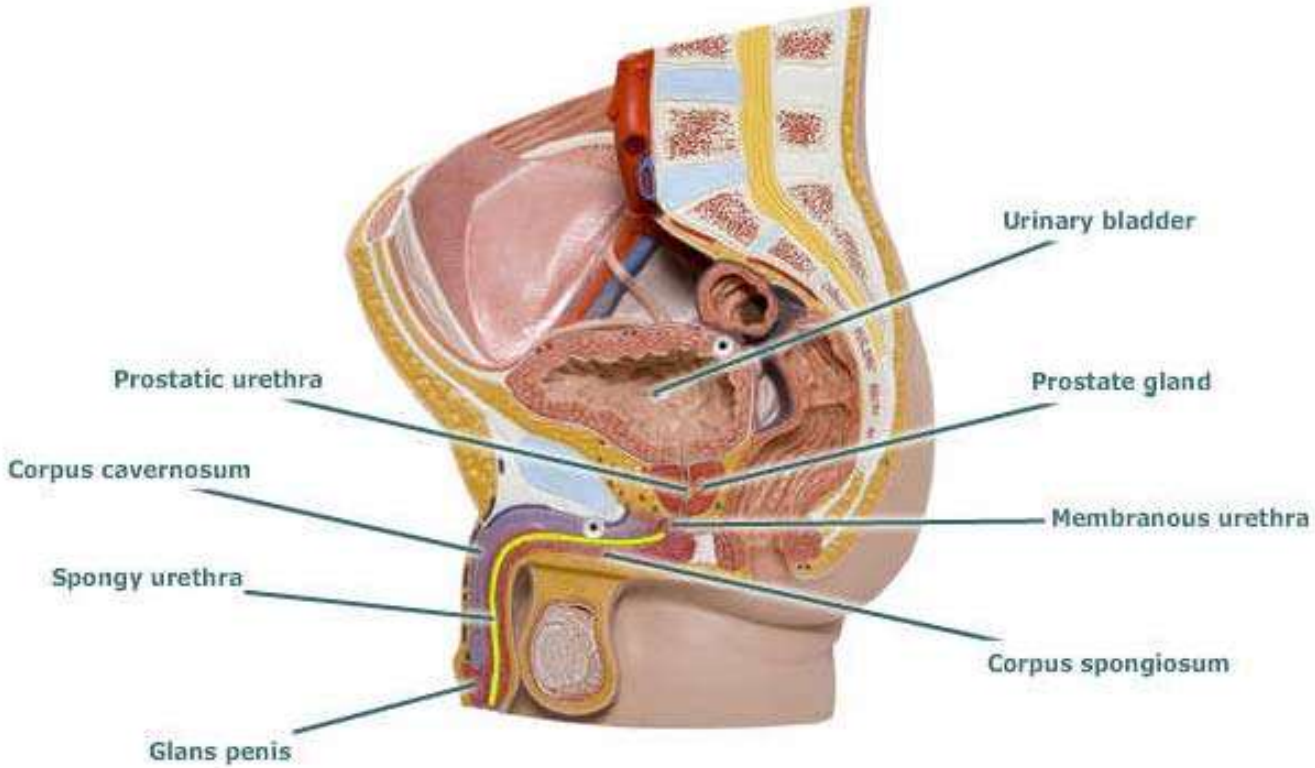
Lower urinary system of the male

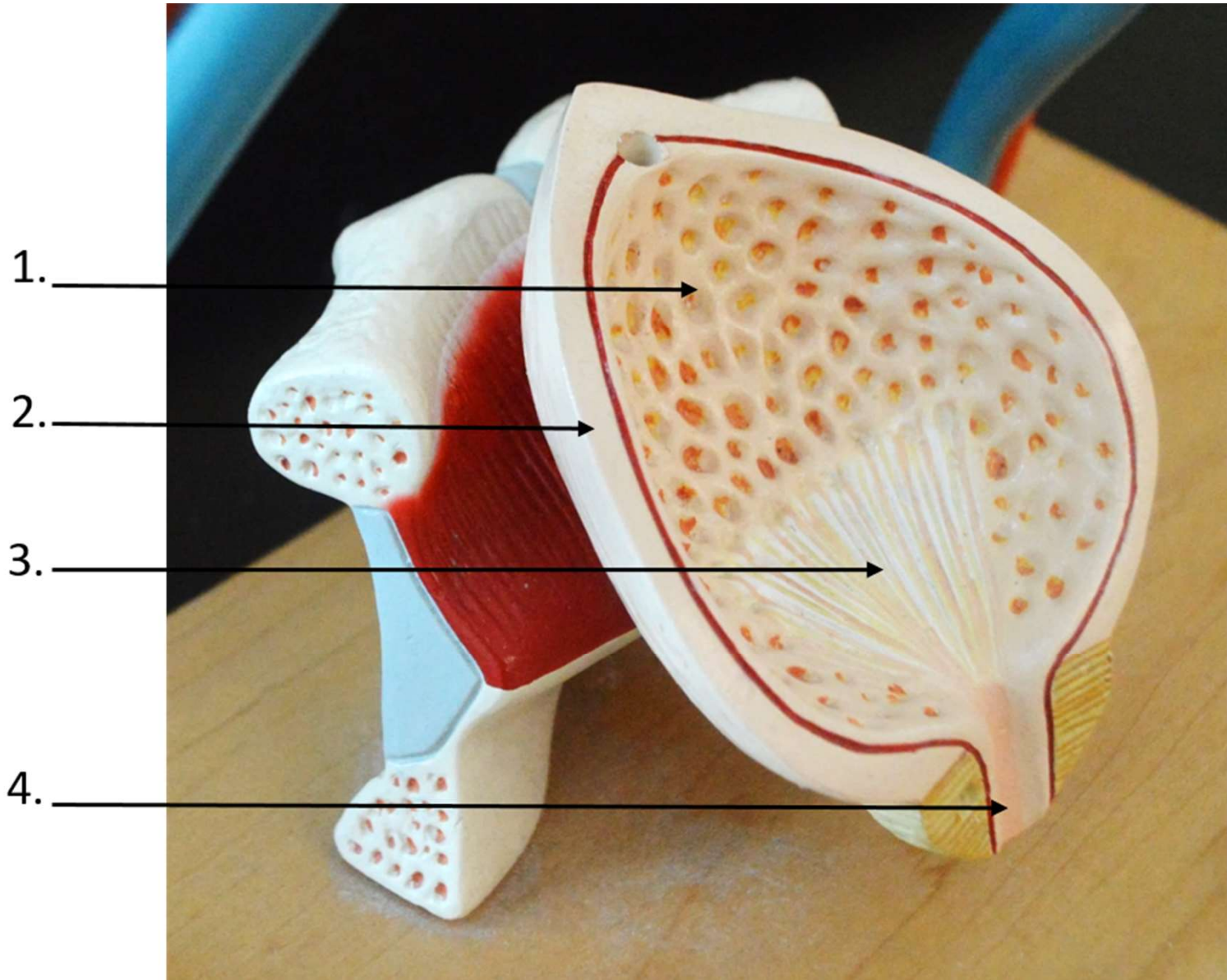


LT-H11: Male Pelvis, 2-part, 38 Scientific08

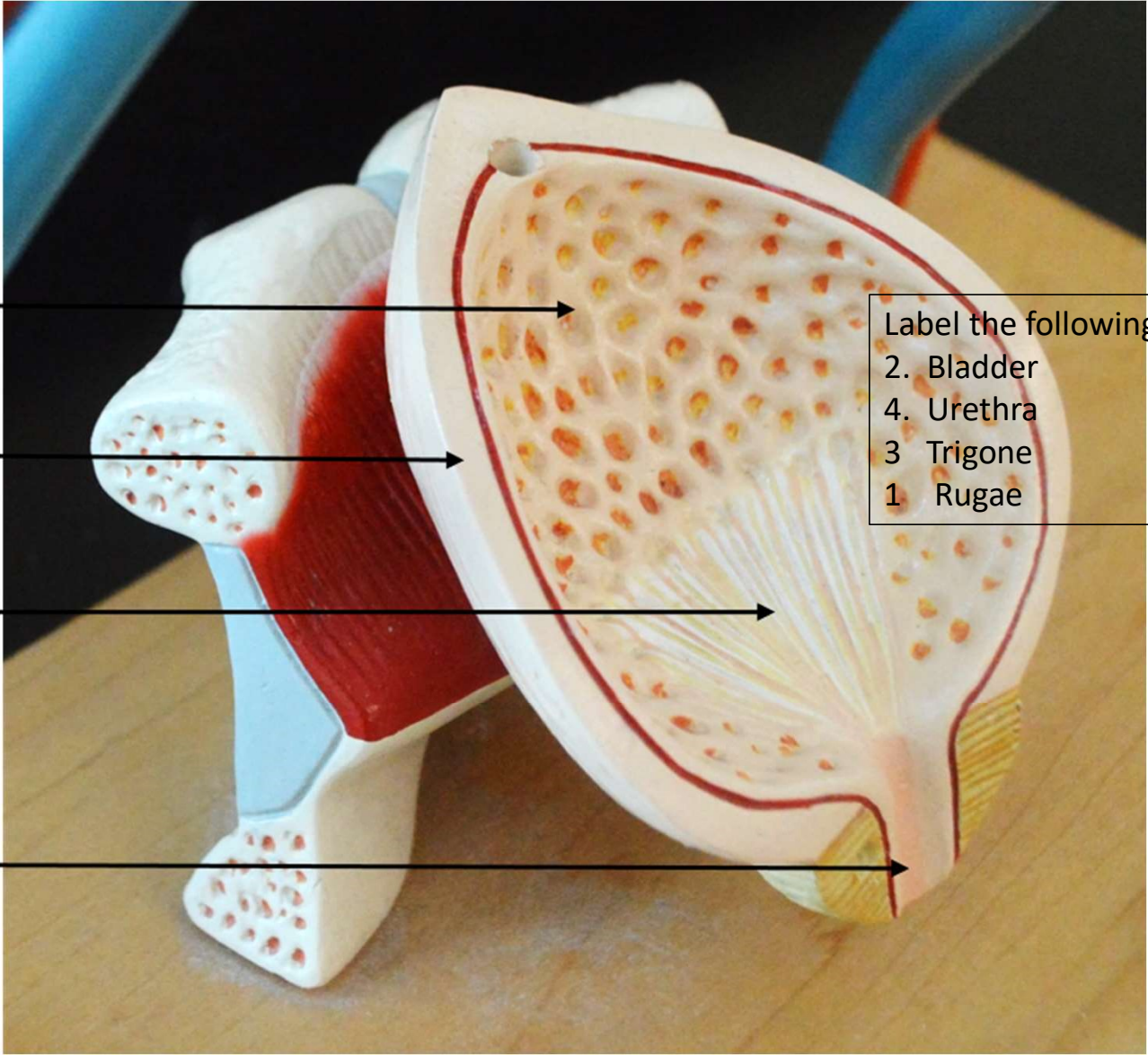


Urinary system in the male



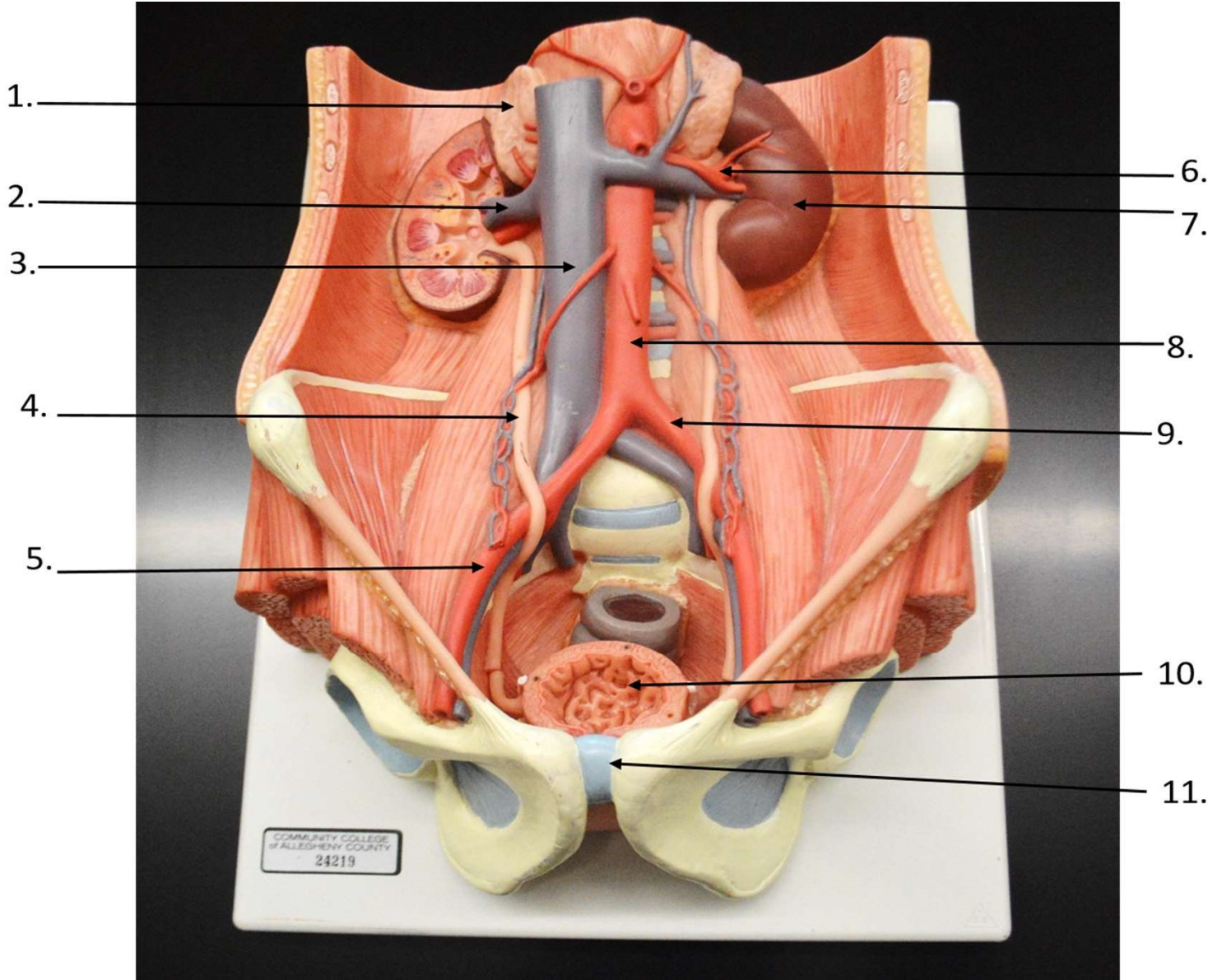


Label the following structures:
Bladder
Urethra
Trigone
Rugae



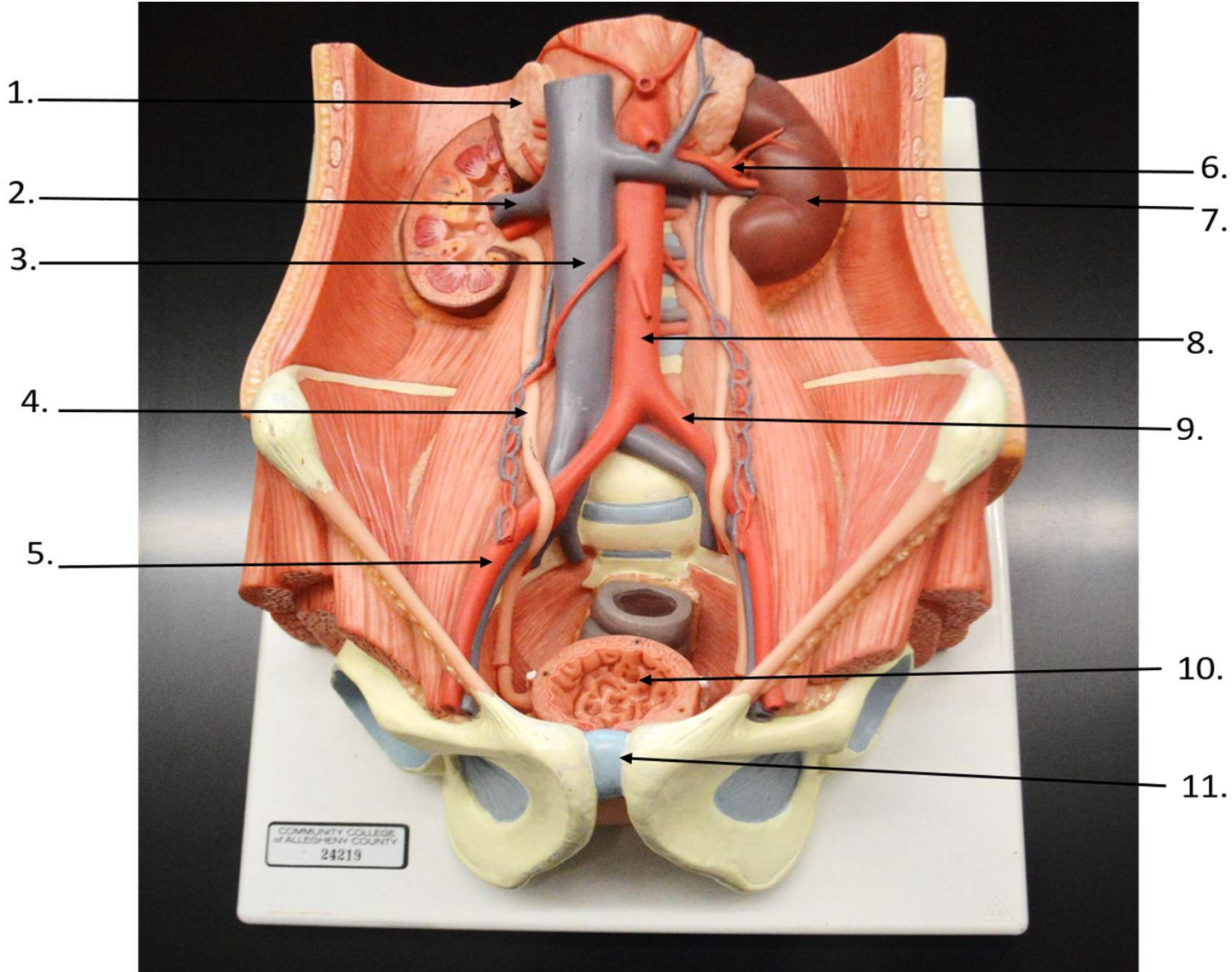
- 1. →
- 2. →
- 3. →
- 4. →

Label the following structures:
2. Bladder
4. Urethra
3. Trigone
1. Rugae



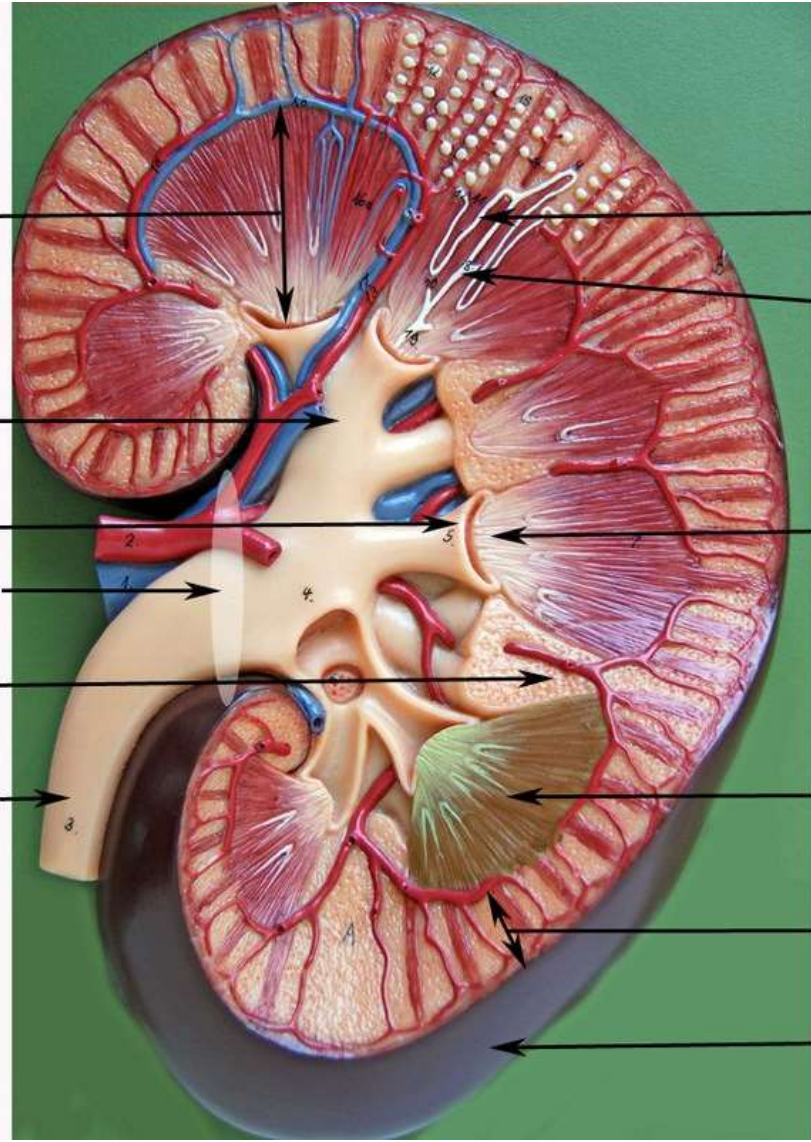
Label the following structures:
 Abdominal Aorta
 Inferior vena cava
 Renal artery
 Renal vein
 Ureter
 Kidney
 Adrenal gland
 Bladder
 Pubic symphysis
 External Iliac artery
 Common Iliac artery

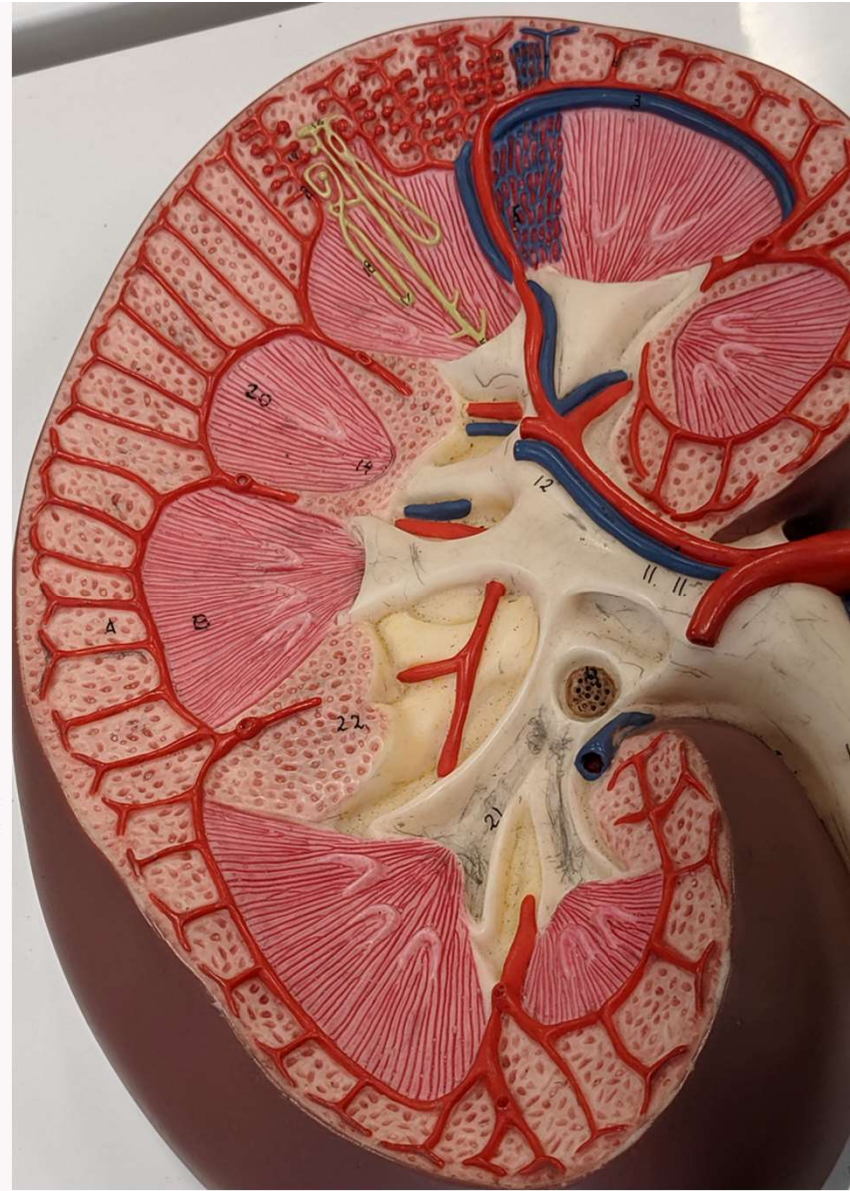
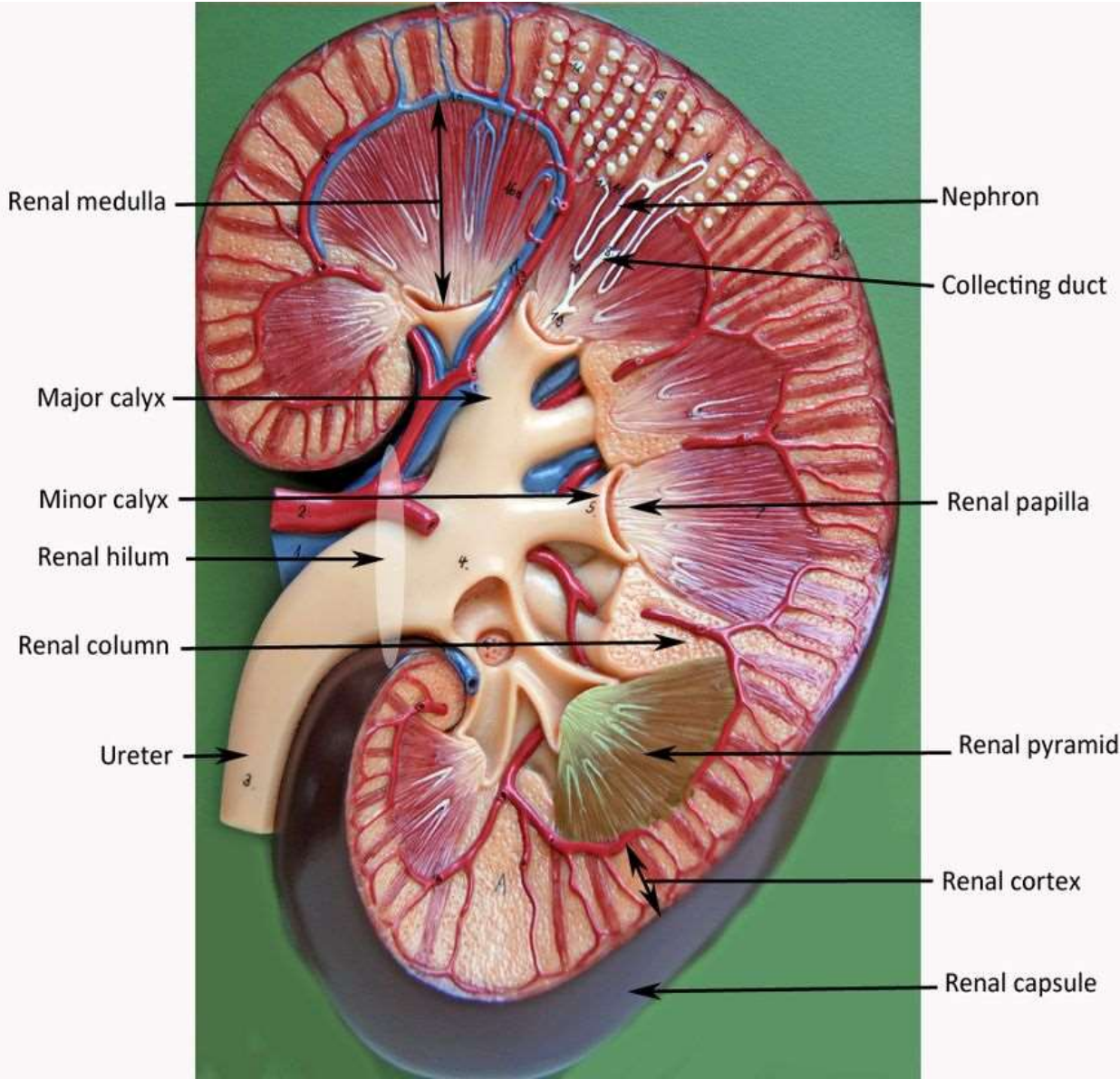
COMMUNITY COLLEGE
 of ALLEGHENY COUNTY
 24219

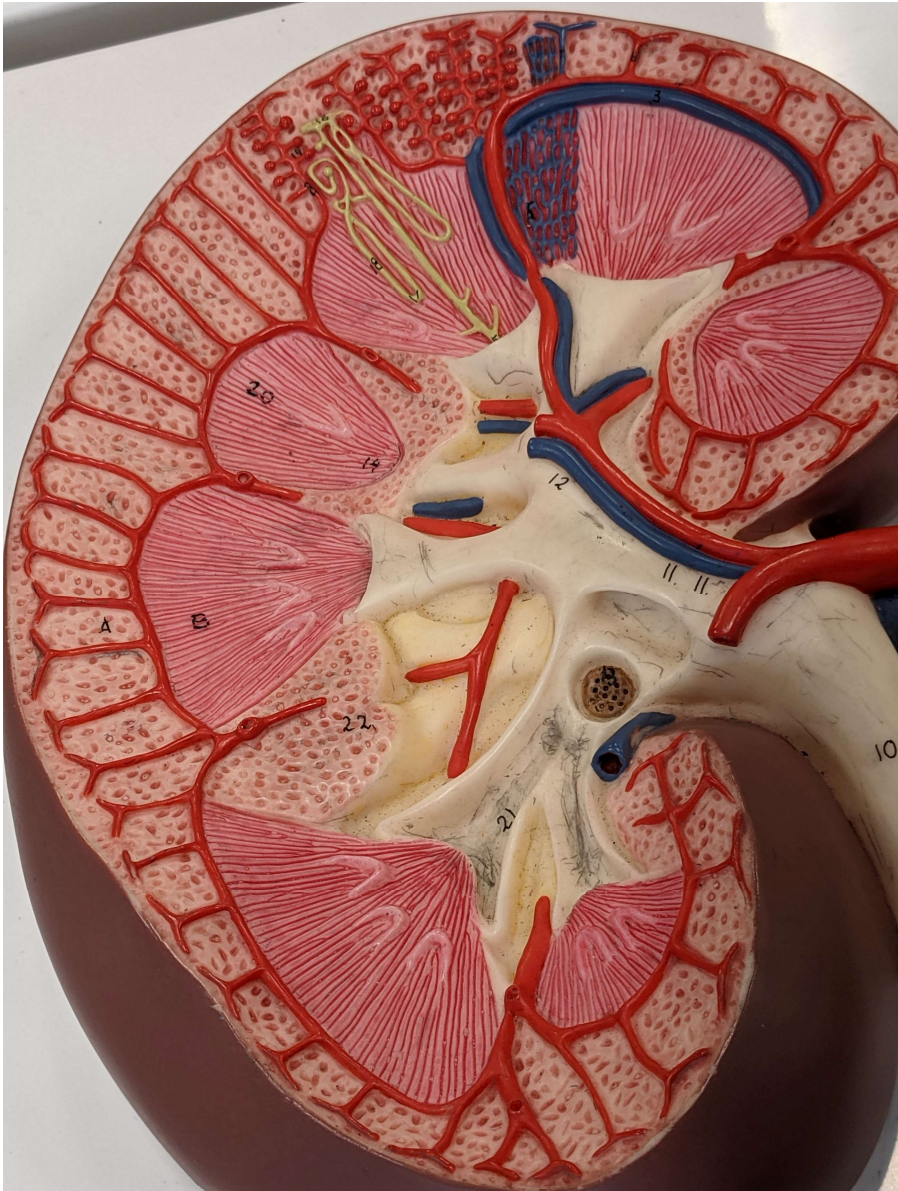


- Label the following structures:
- 8 Abdominal Aorta
 - 3 Inferior vena cava
 - 6 Renal artery
 - 2 Renal vein
 - 4 Ureter
 - 7 Kidney
 - 1 Adrenal gland
 - 10 Bladder
 - 11 Pubic symphysis
 - 5 External Iliac artery
 - 9 Common Iliac artery

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OF ALLEGHENY COUNTY
24219







Where are the juxtaglomerular cells located?

What do the juxtaglomerular cells sense/monitor?



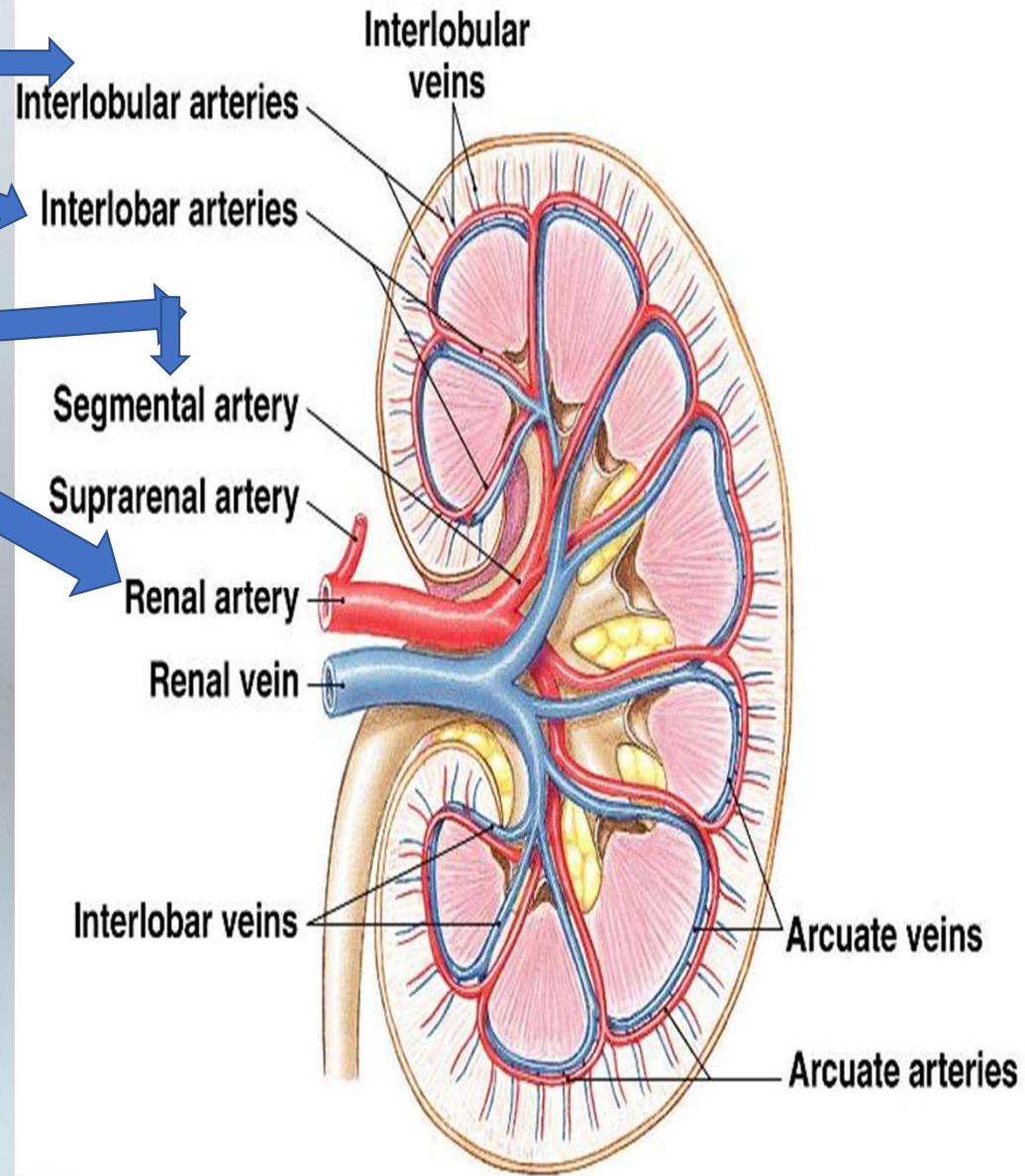
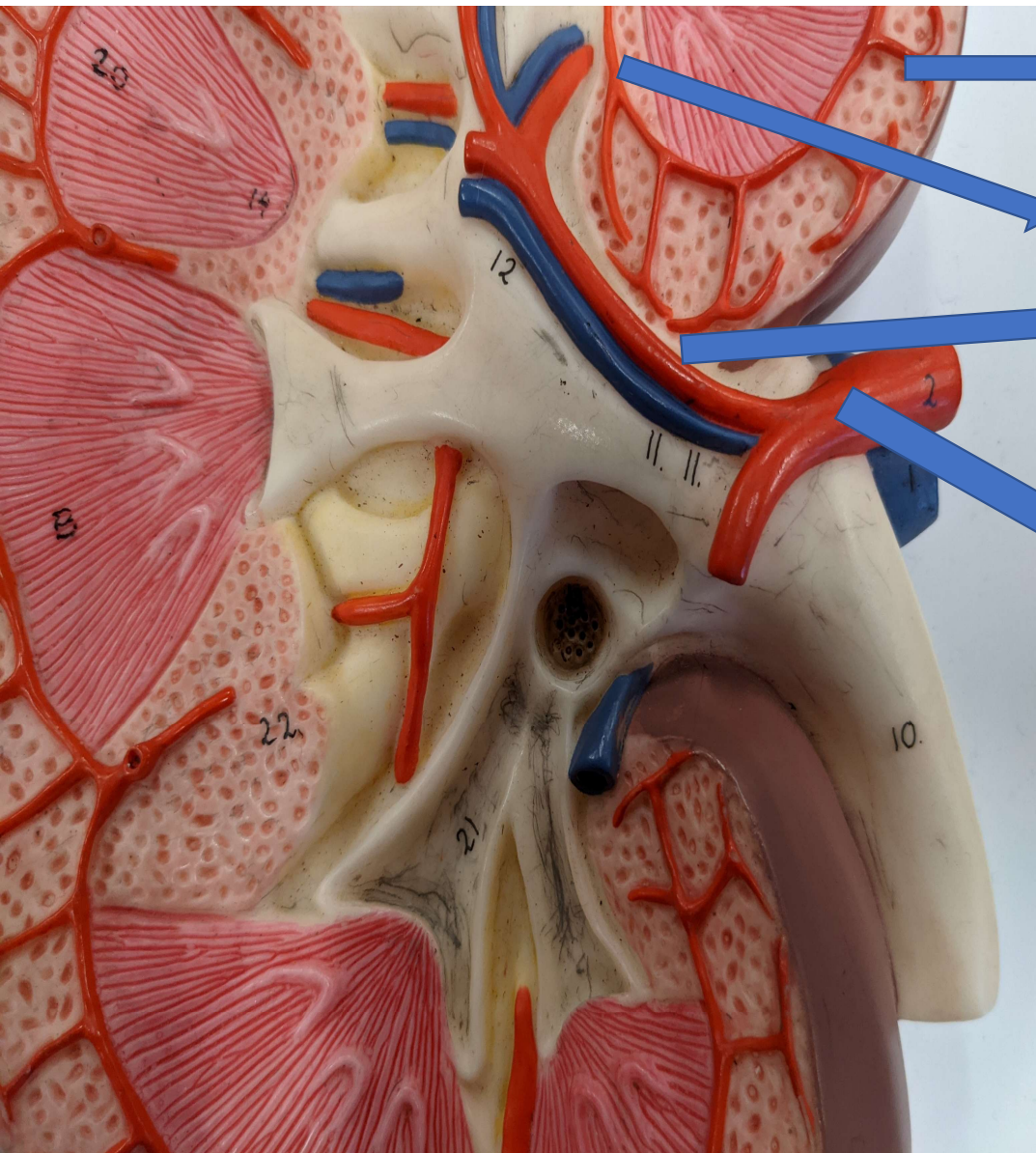
Where are the juxtaglomerular cells located?

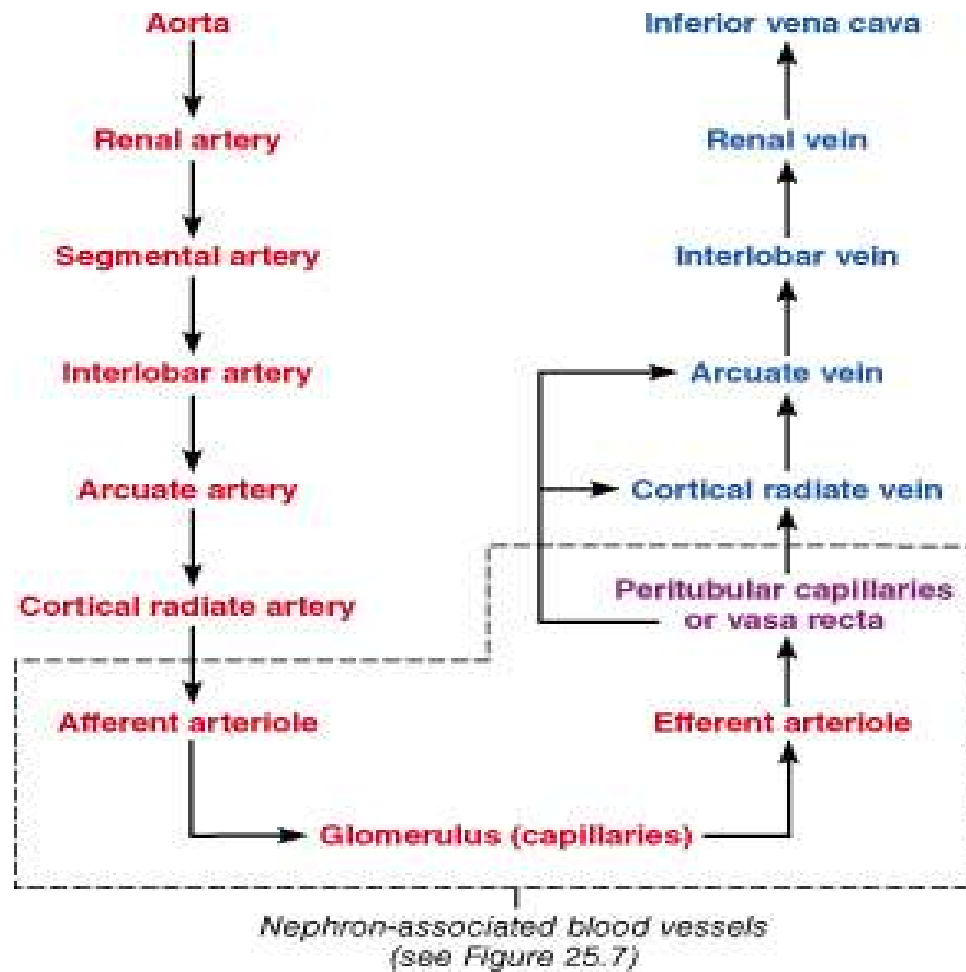
Afferent arteriole

What do the juxtaglomerular cells sense/monitor?

Blood pressure





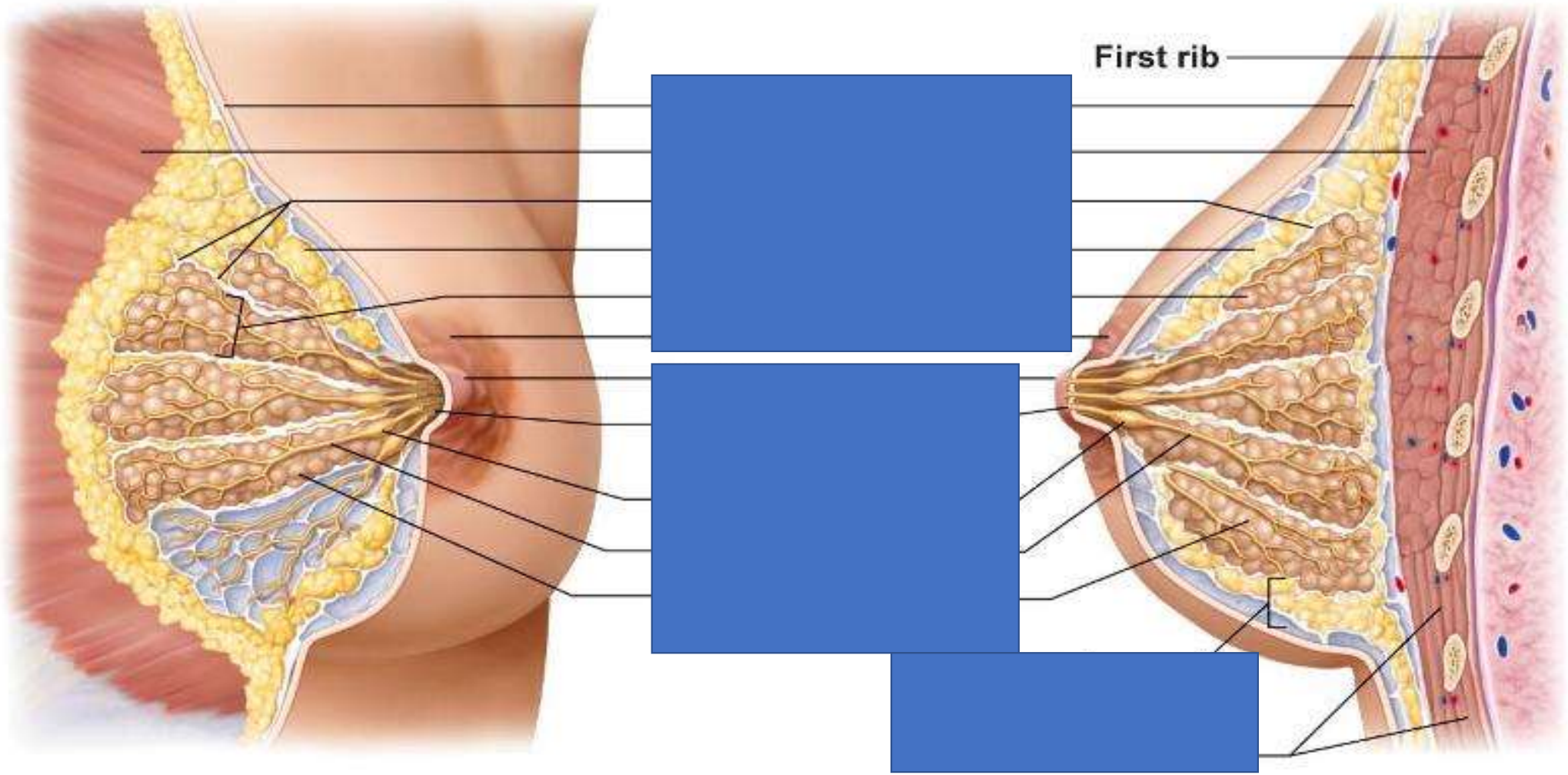


(b) Path of blood flow through renal blood vessels

Erythropoietin (EPO) is a hormone that is produced?

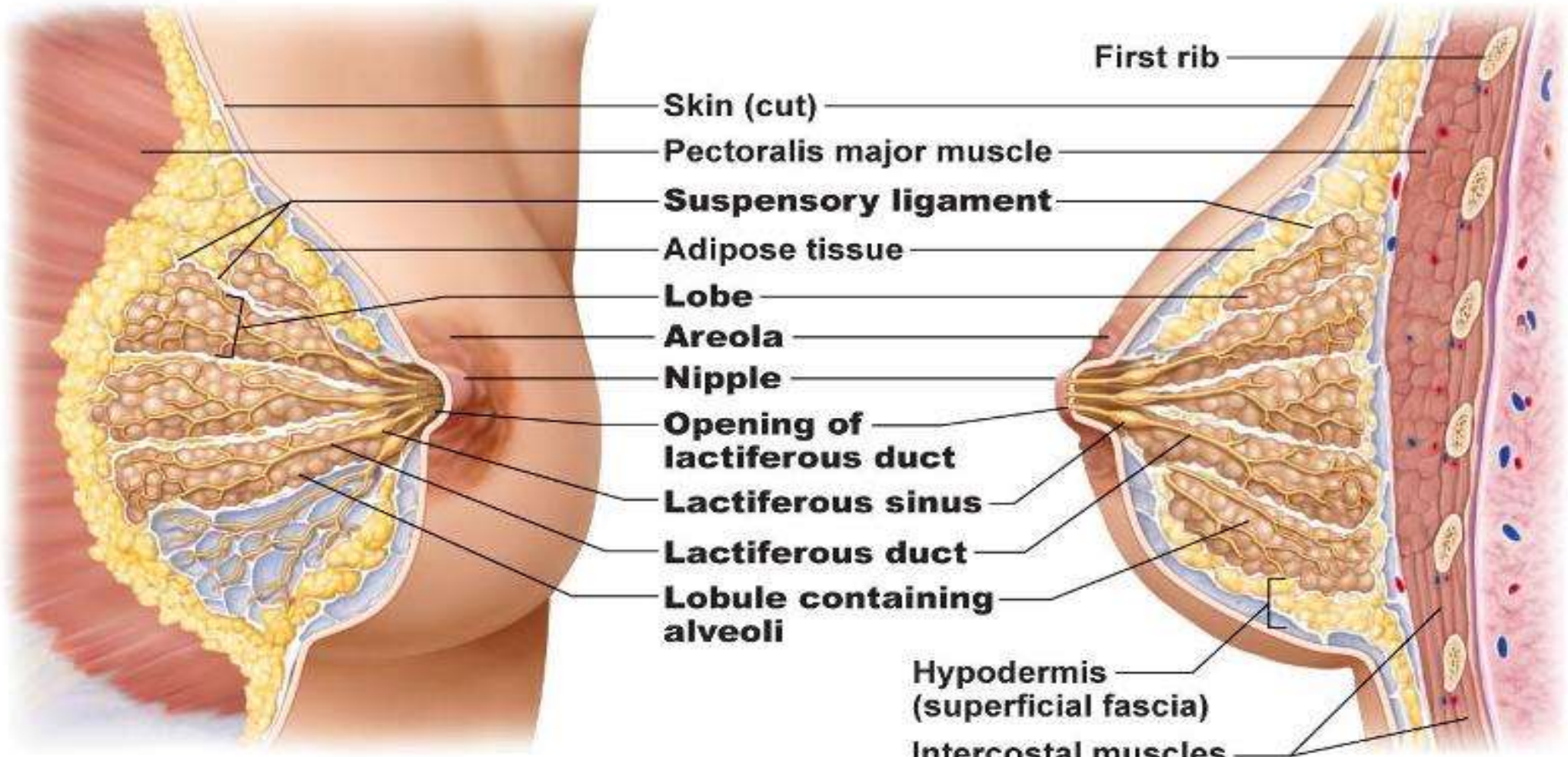
Erythropoietin (EPO) is a hormone that is produced predominantly by specialised cells called **interstitial cells in the kidney**.

Reproductive



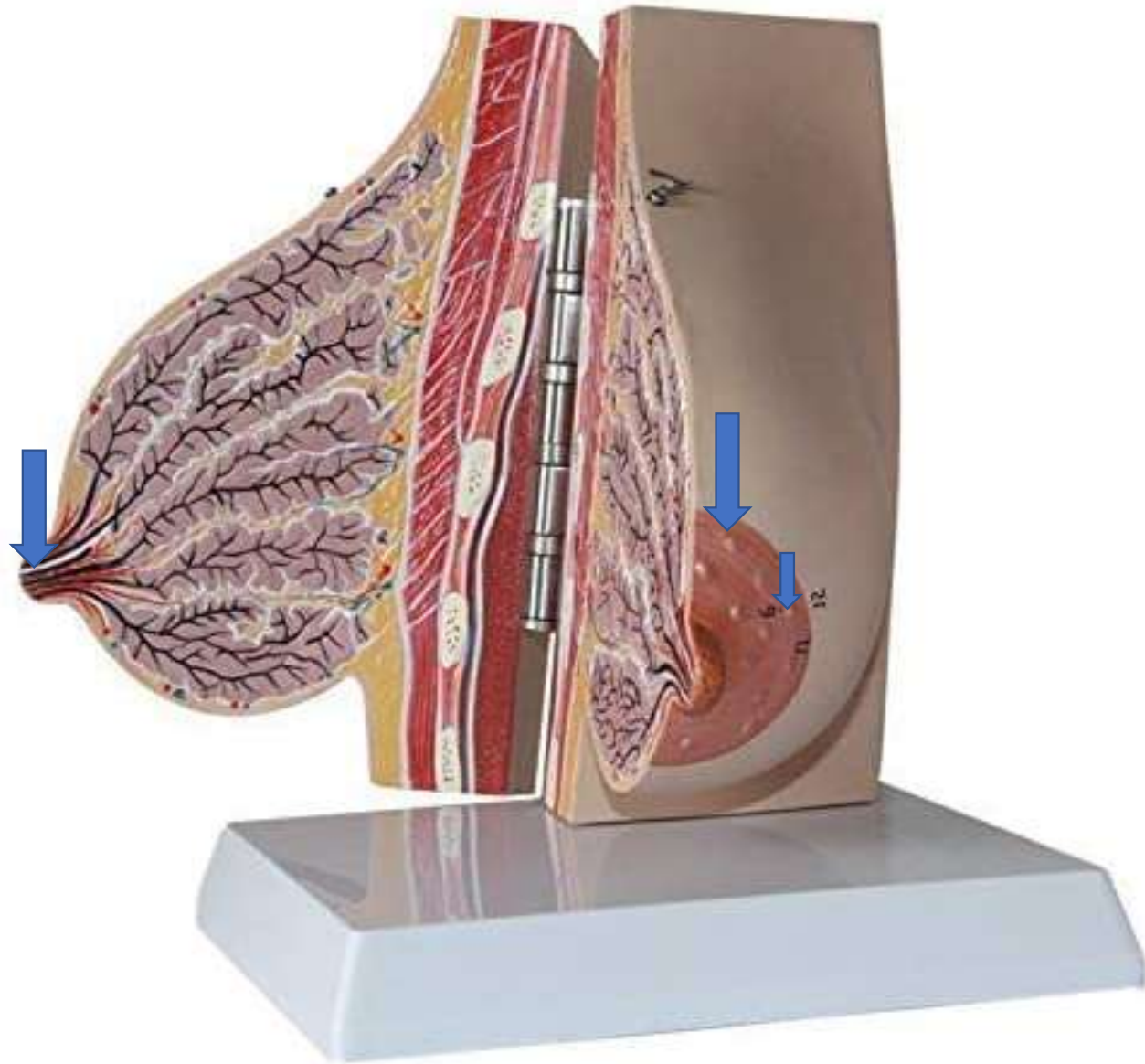
(a)

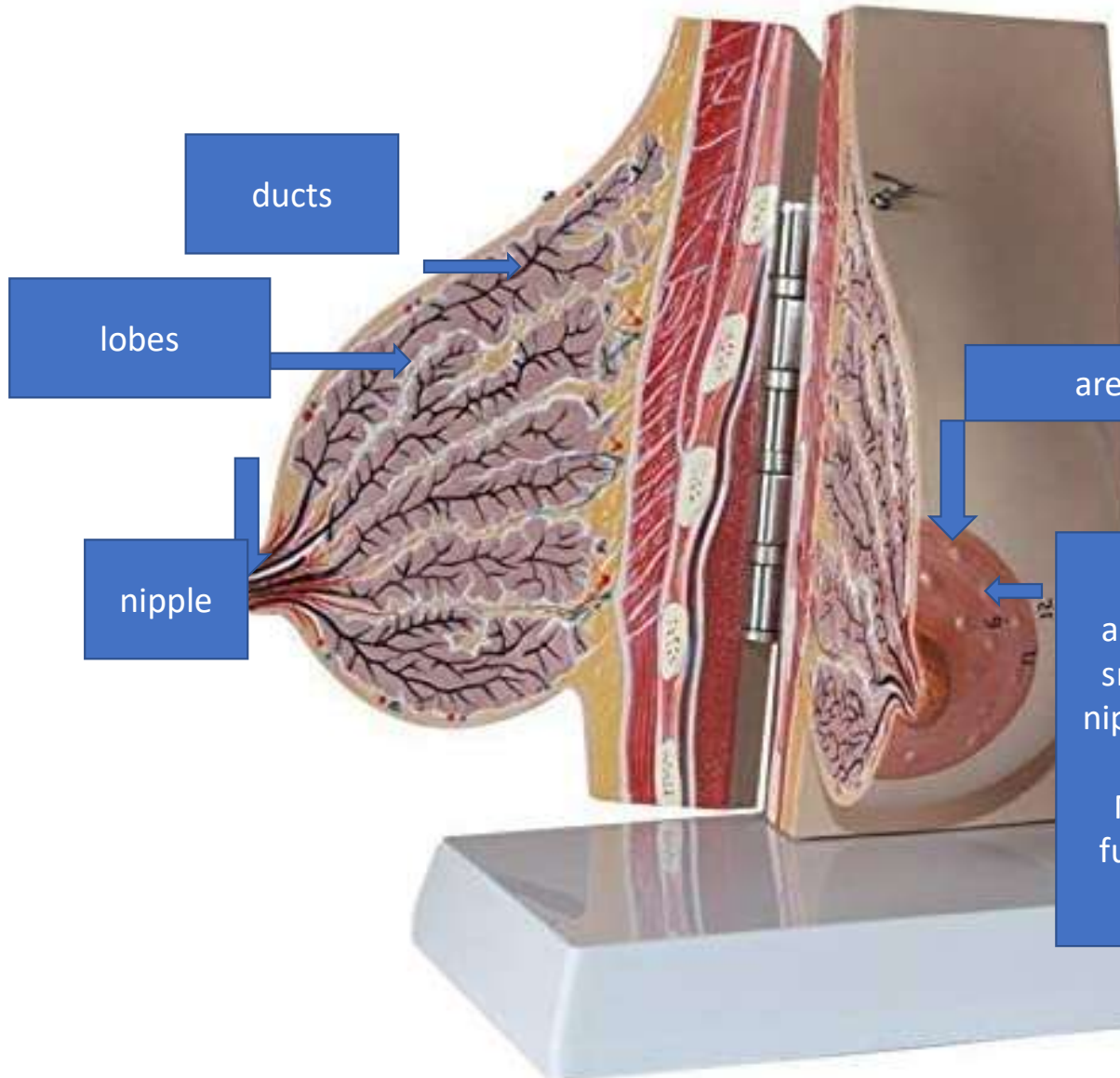
(b)



(a)

(b)



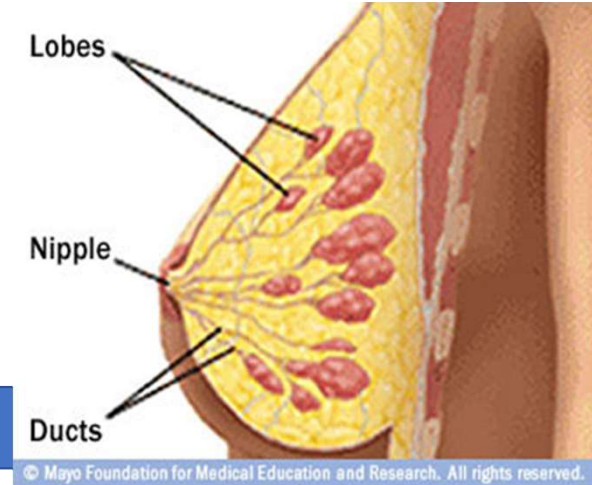


ducts

lobes

nipple

areola



Lobes

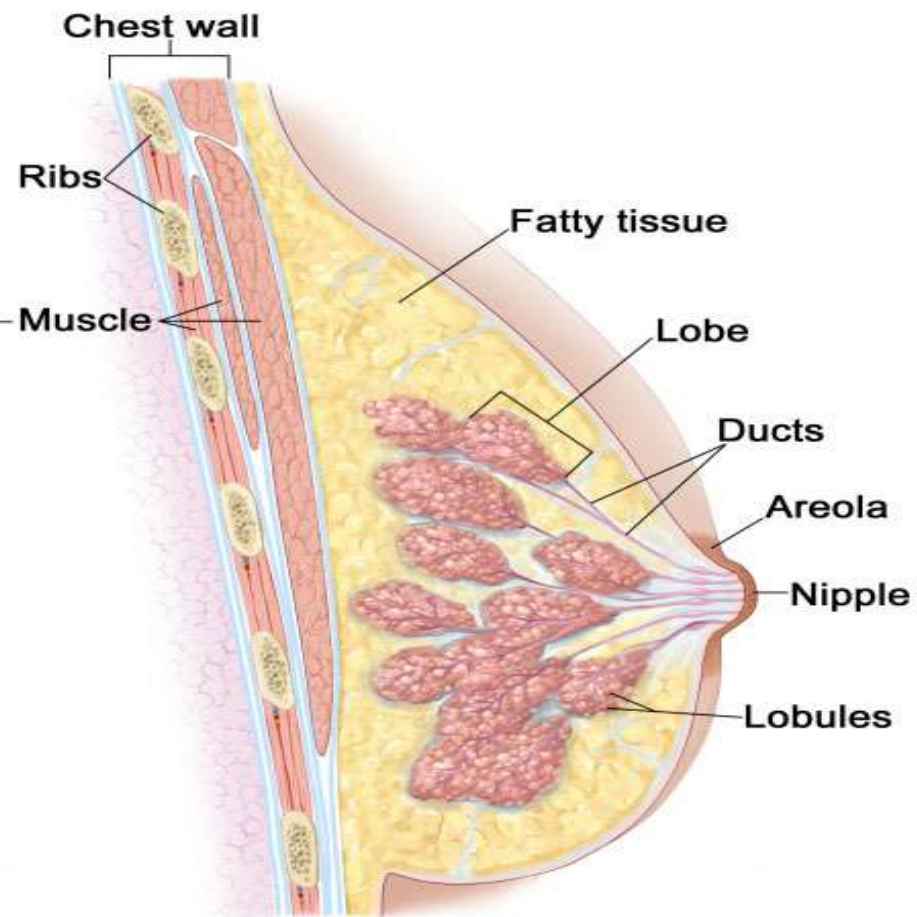
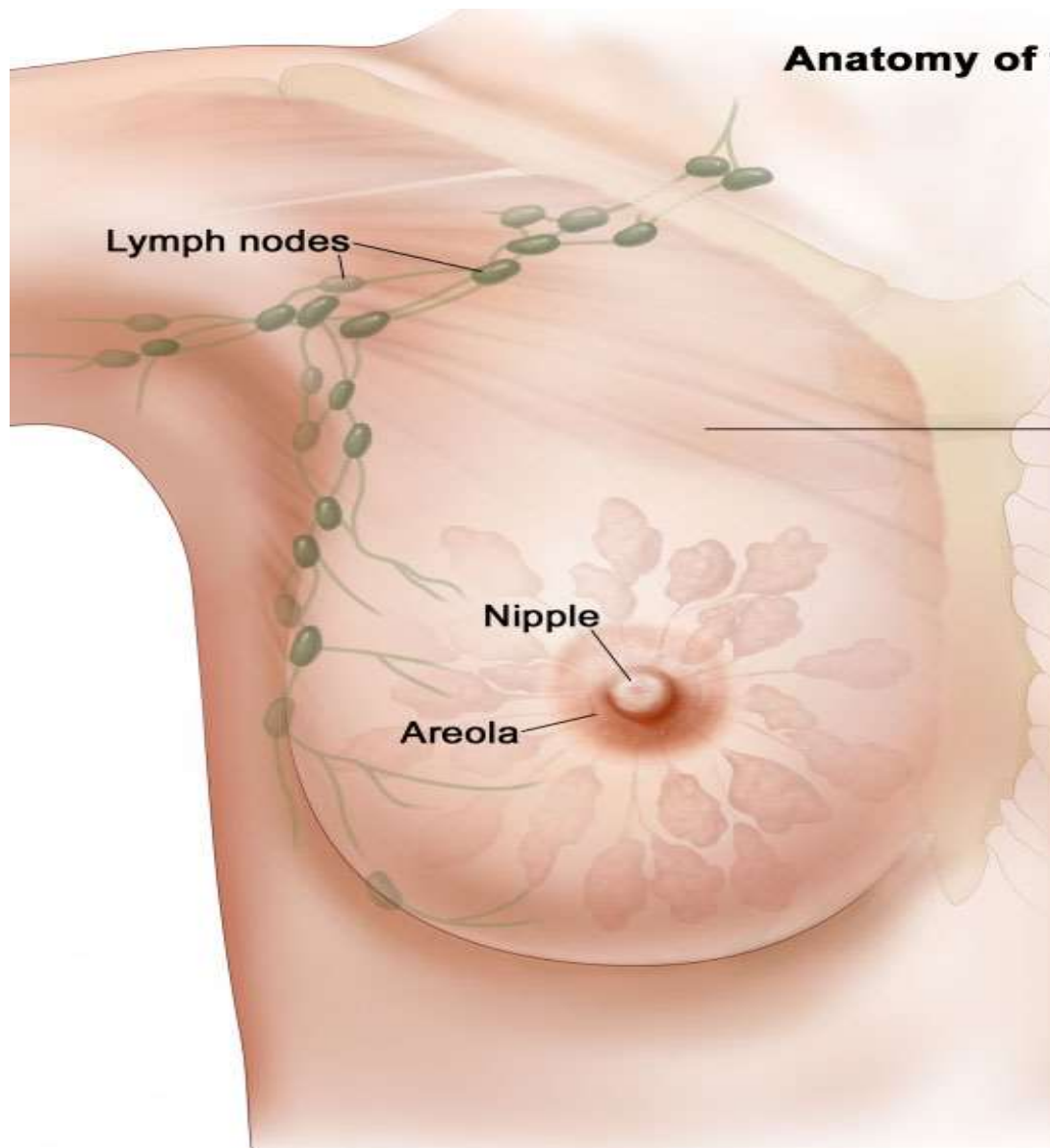
Nipple

Ducts

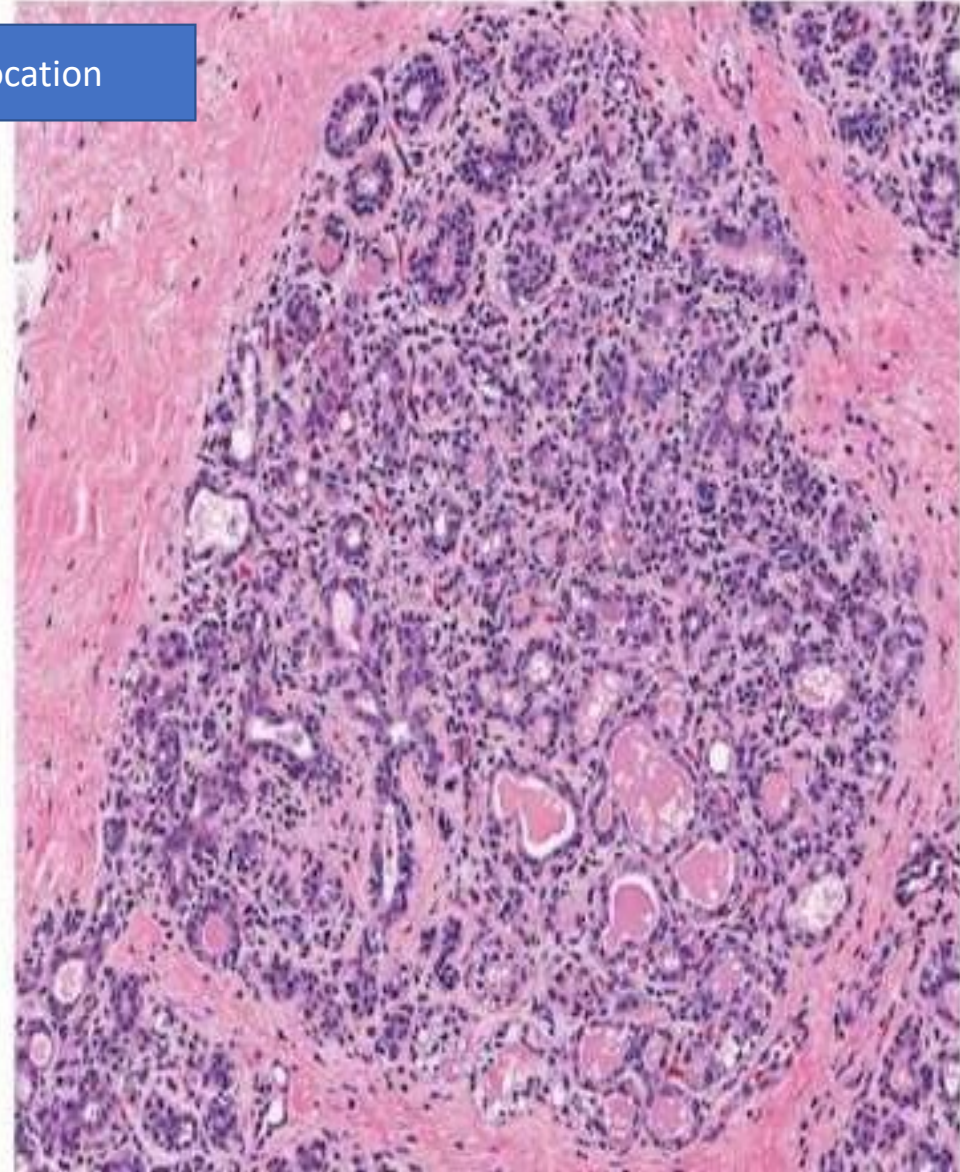
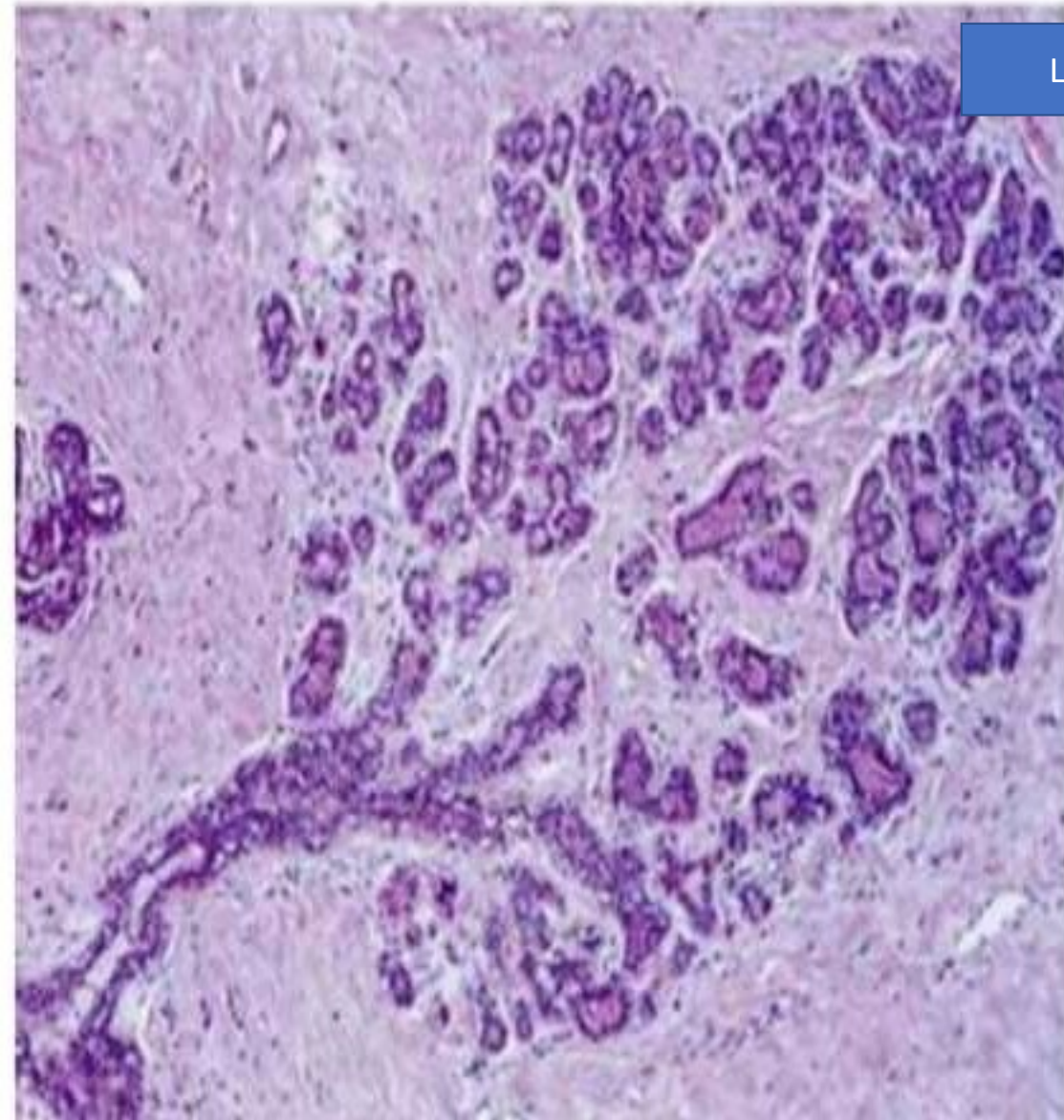
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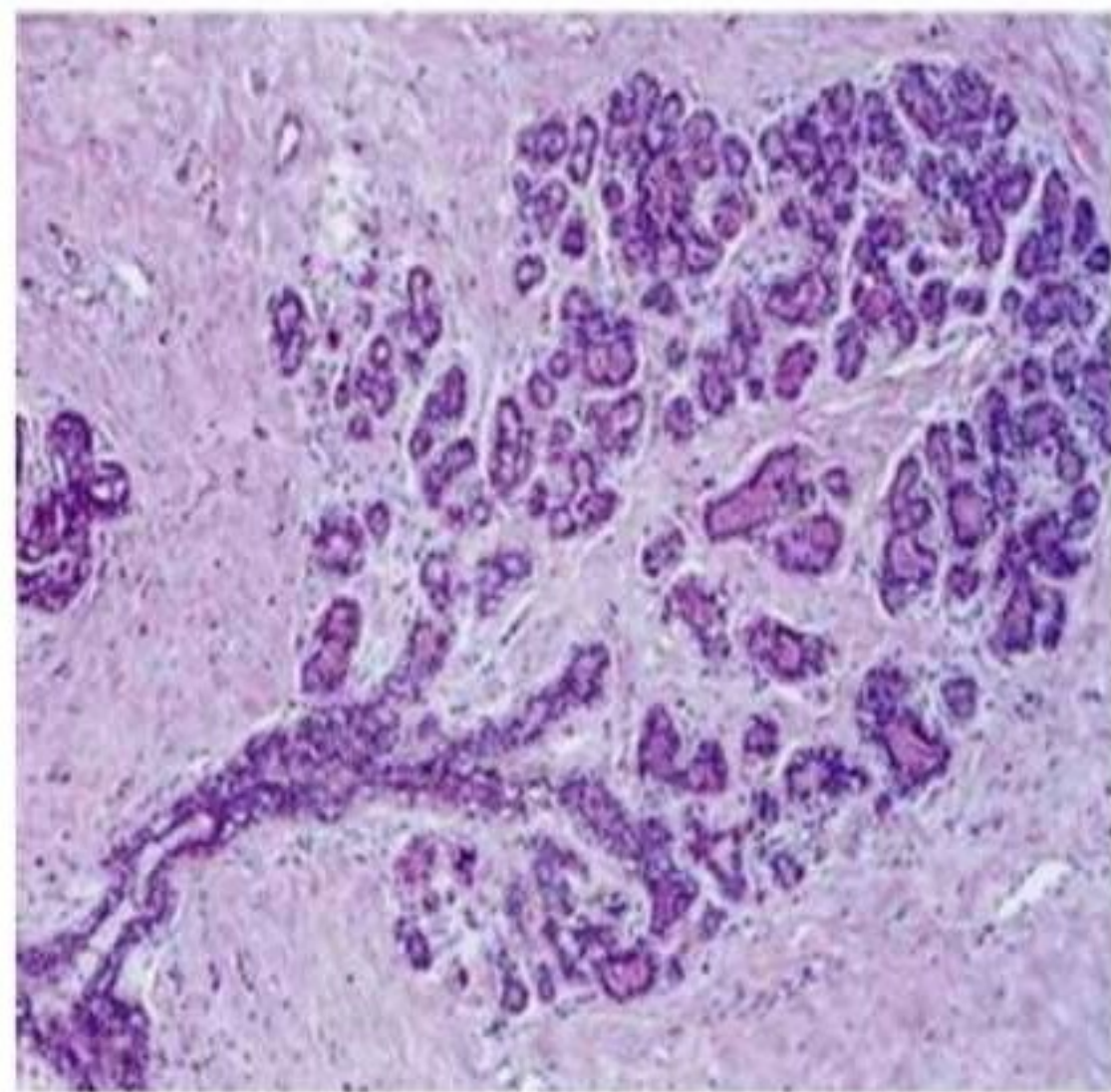
Montgomery's tubercles are sebaceous (oil) glands that appear as small bumps around the dark area of the nipple. Studies have found between 30 and 50 percent of pregnant women notice Montgomery's tubercles. Their primary function is lubricating and keeping germs away from the breasts.

Anatomy of the Female Breast

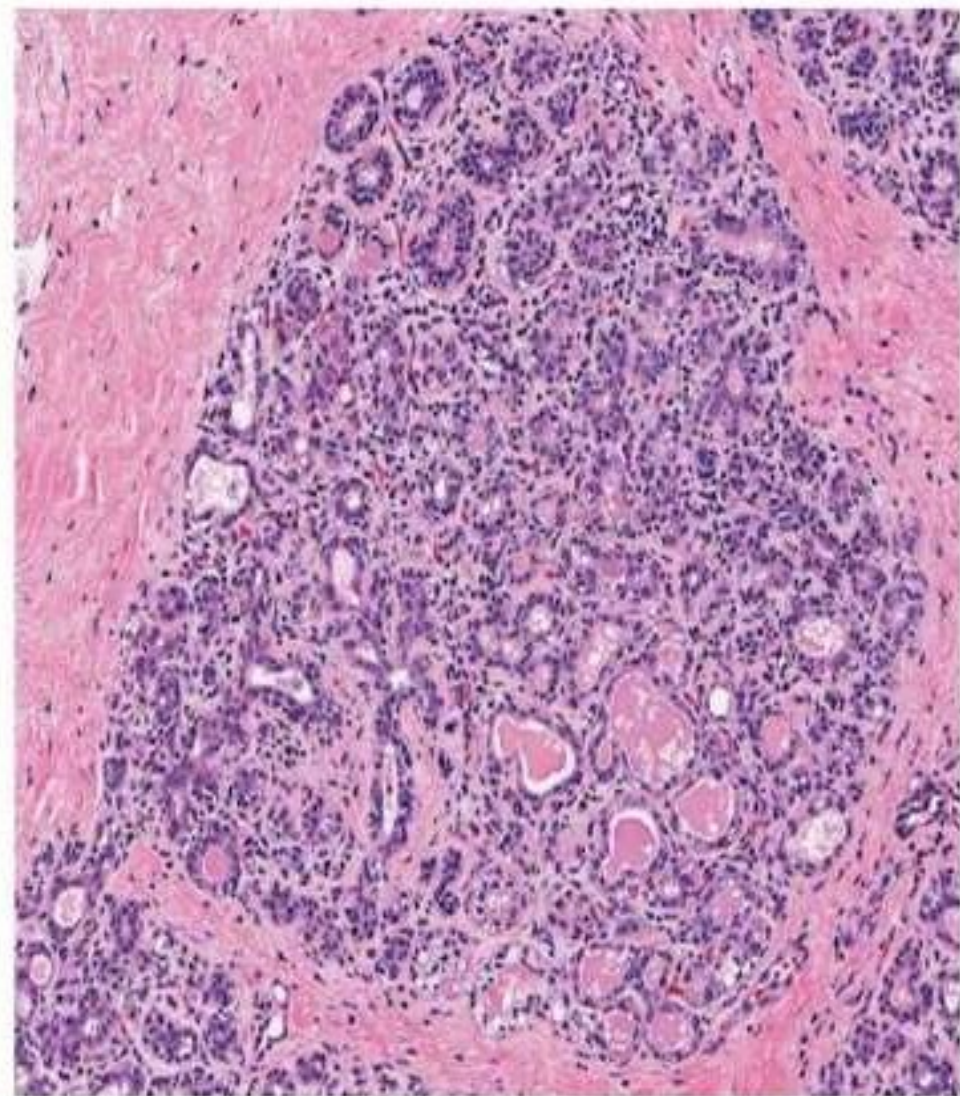


Location

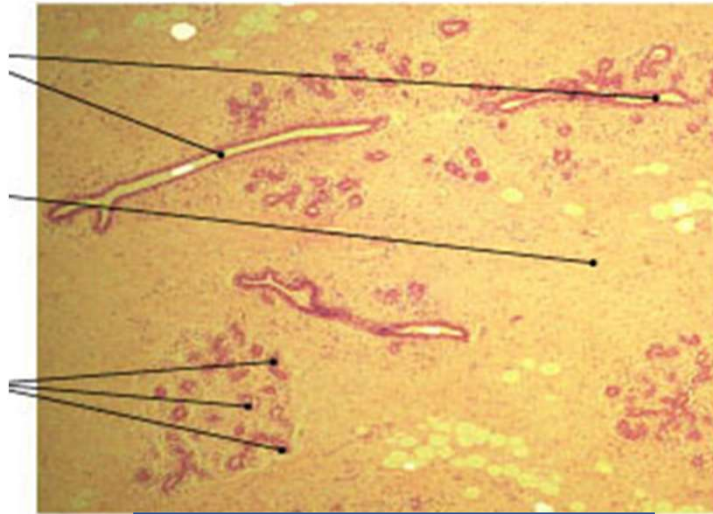




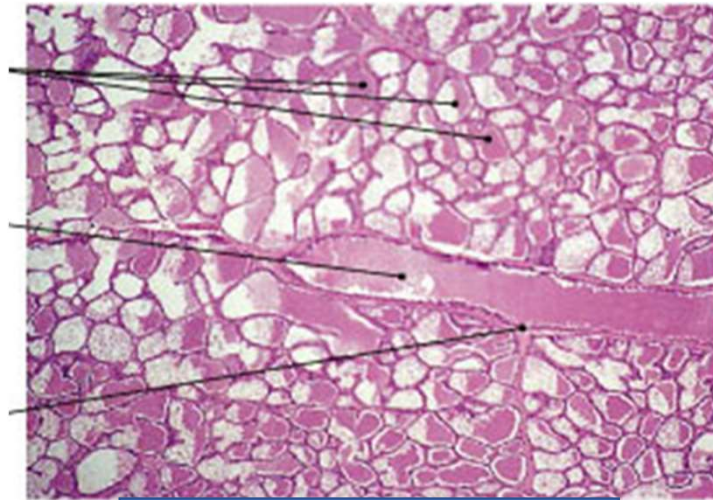
Before pregnancy



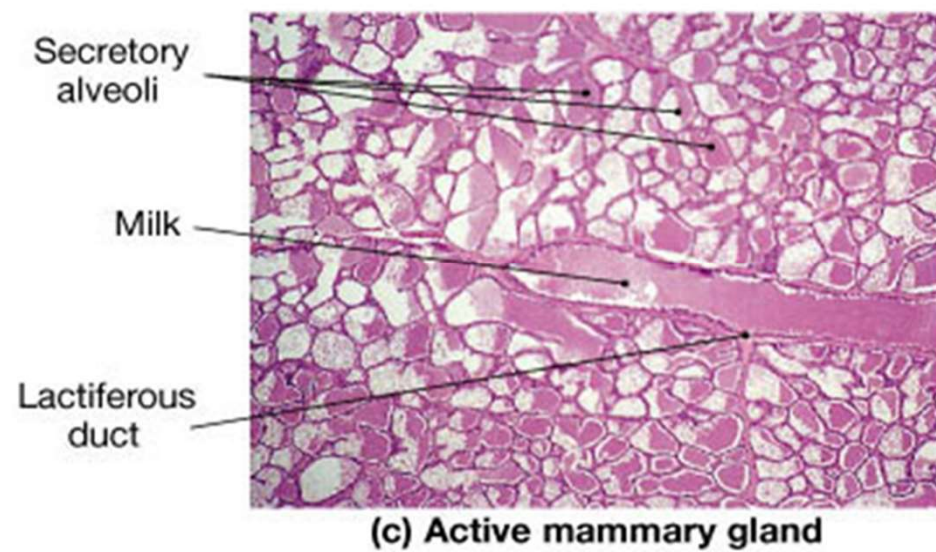
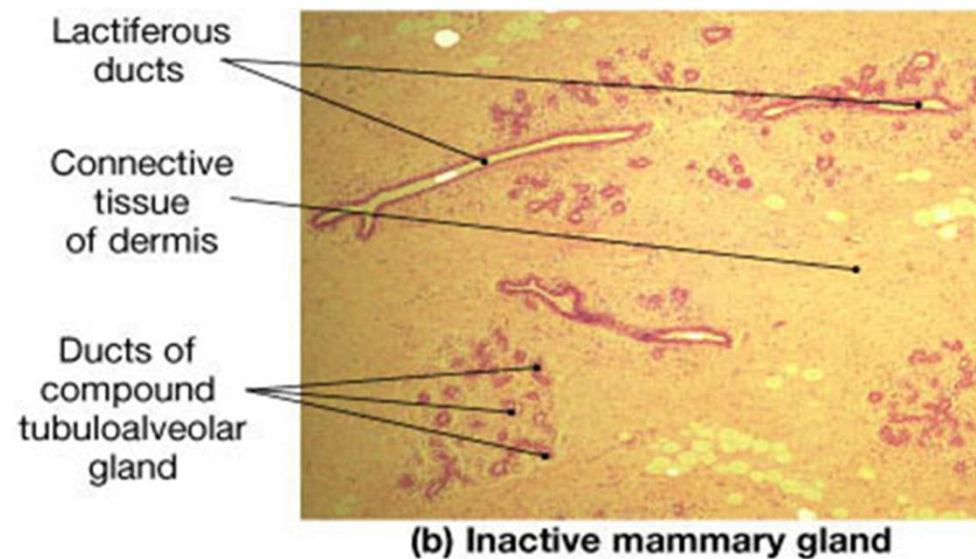
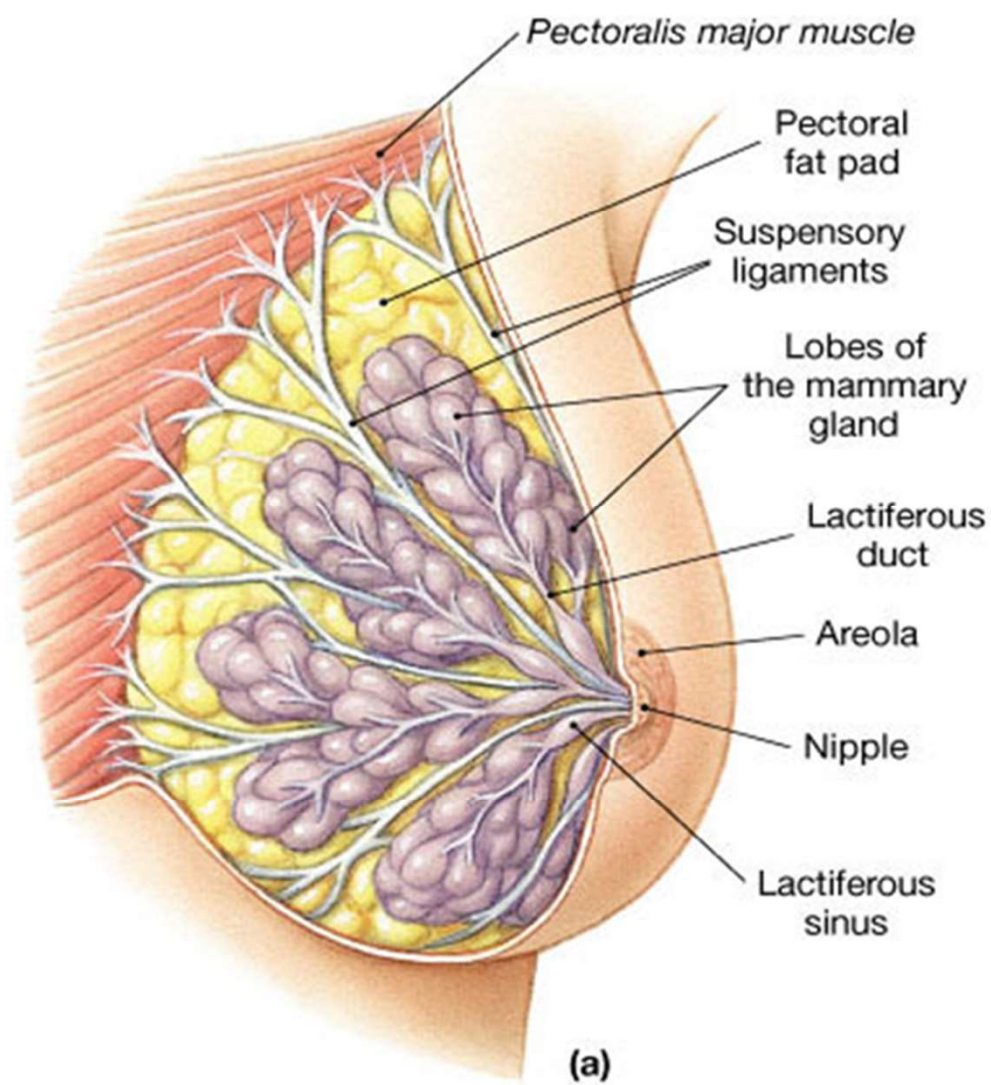
Late pregnancy



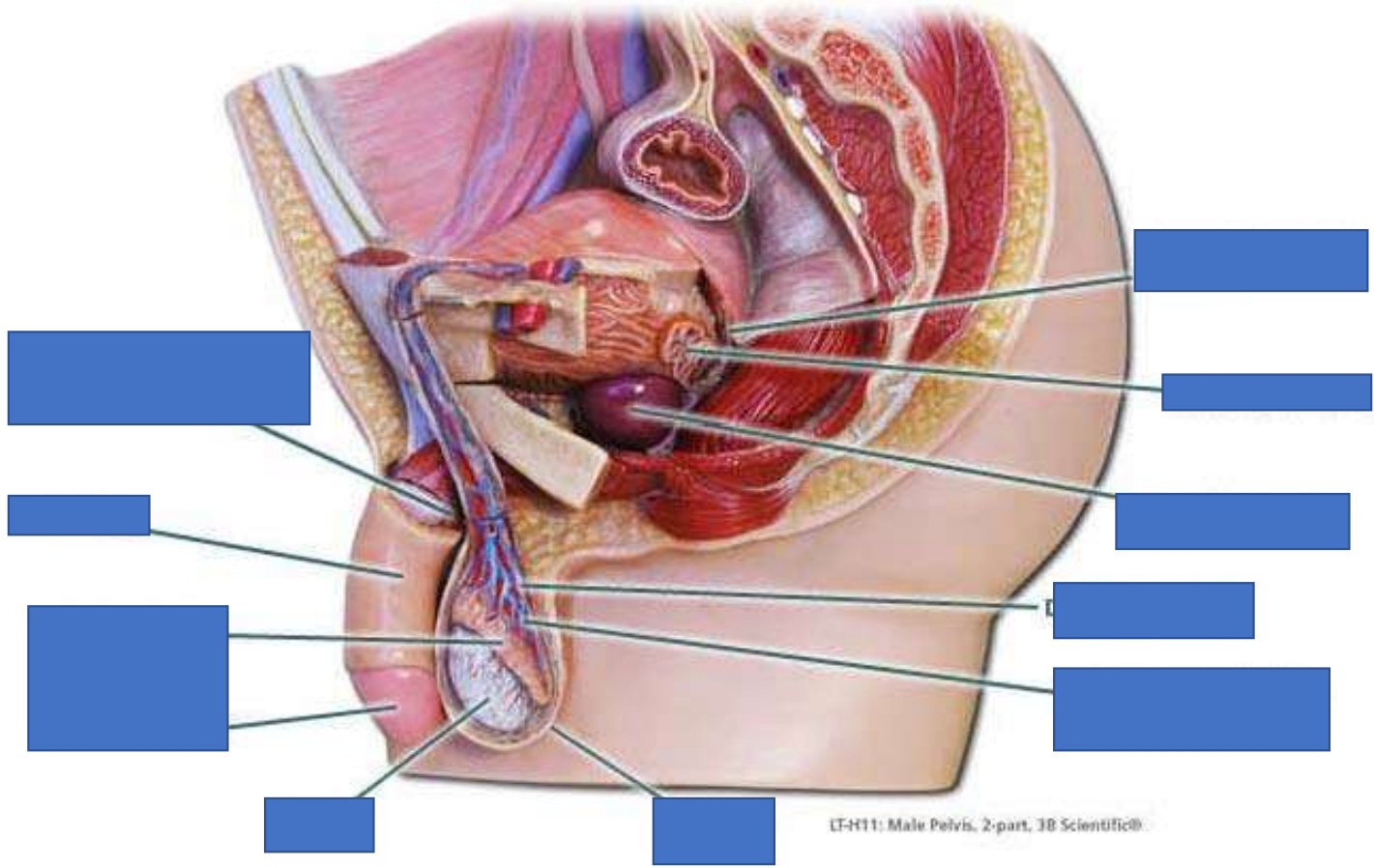
?



?

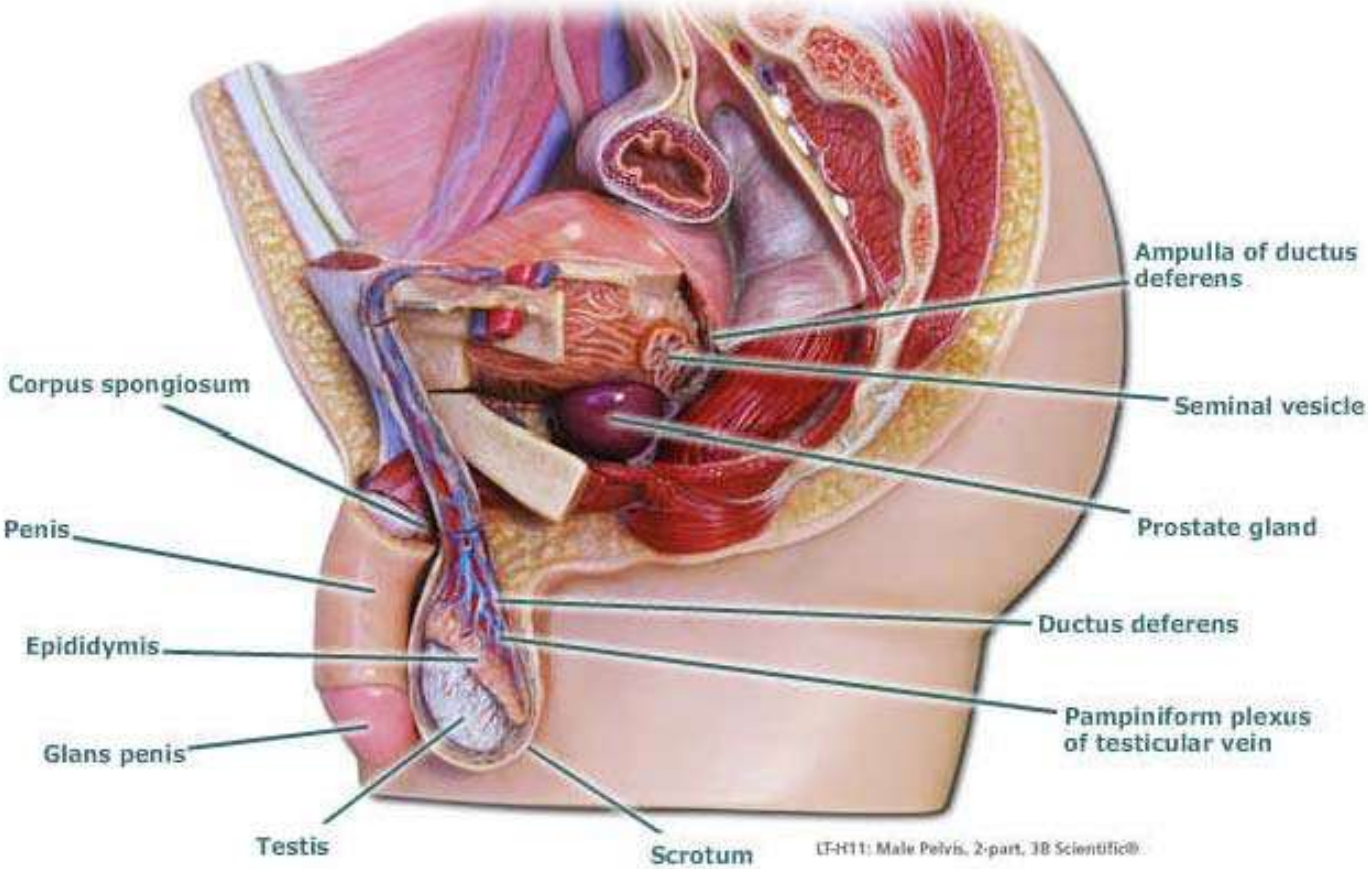


Reproductive organs of the male

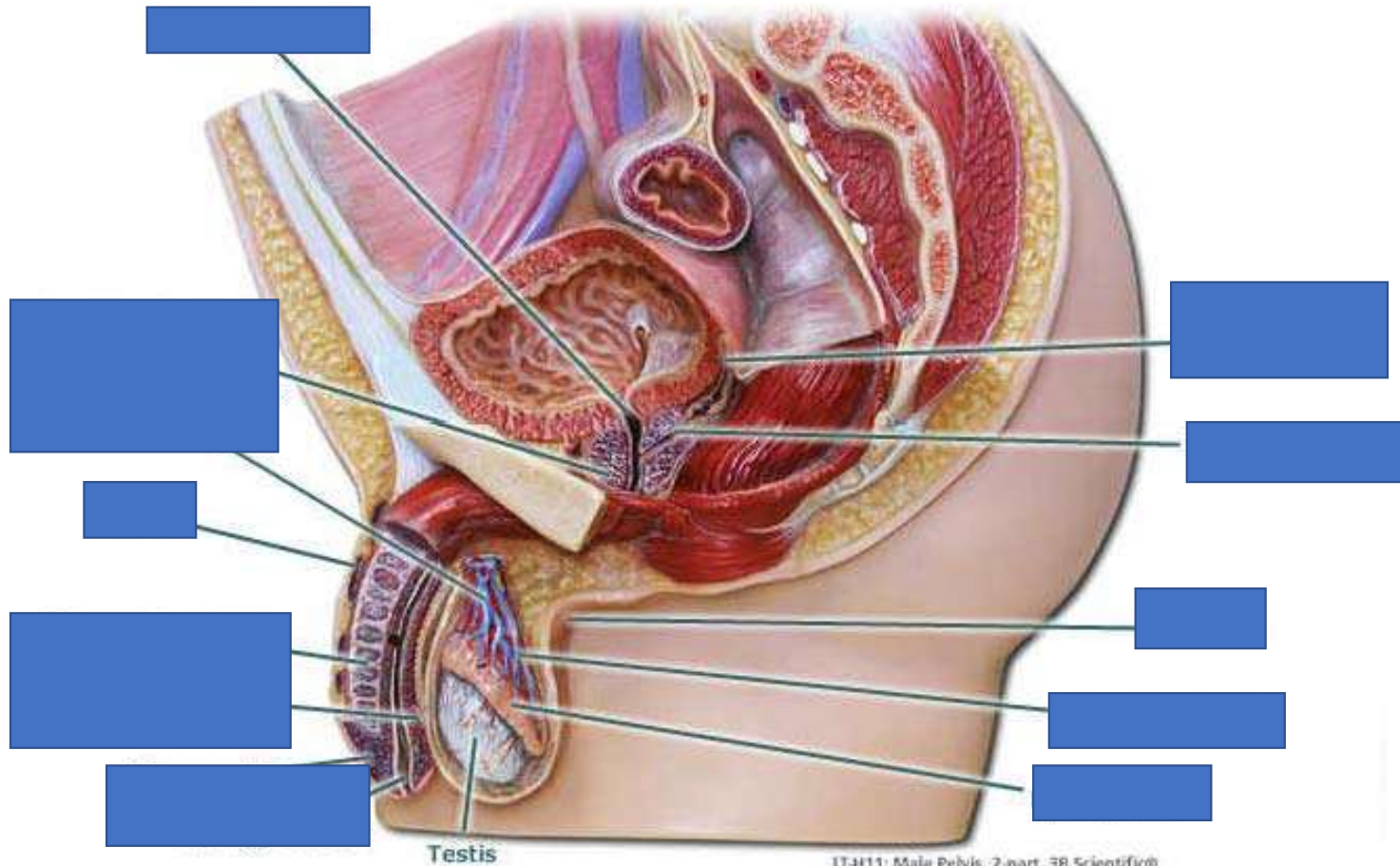


LT-H11: Male Pelvis, 2-part, 3B Scientific®

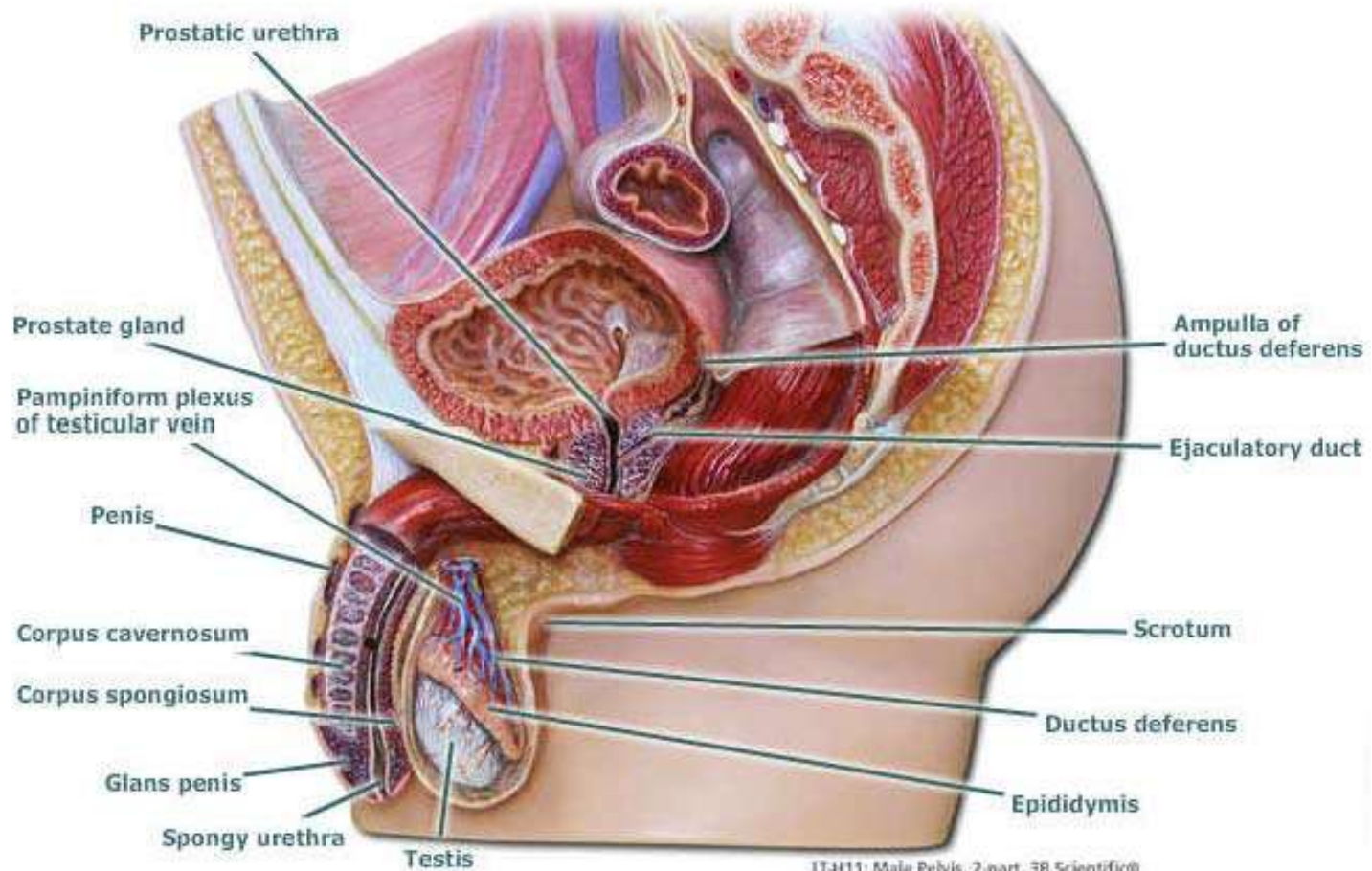
Reproductive organs of the male



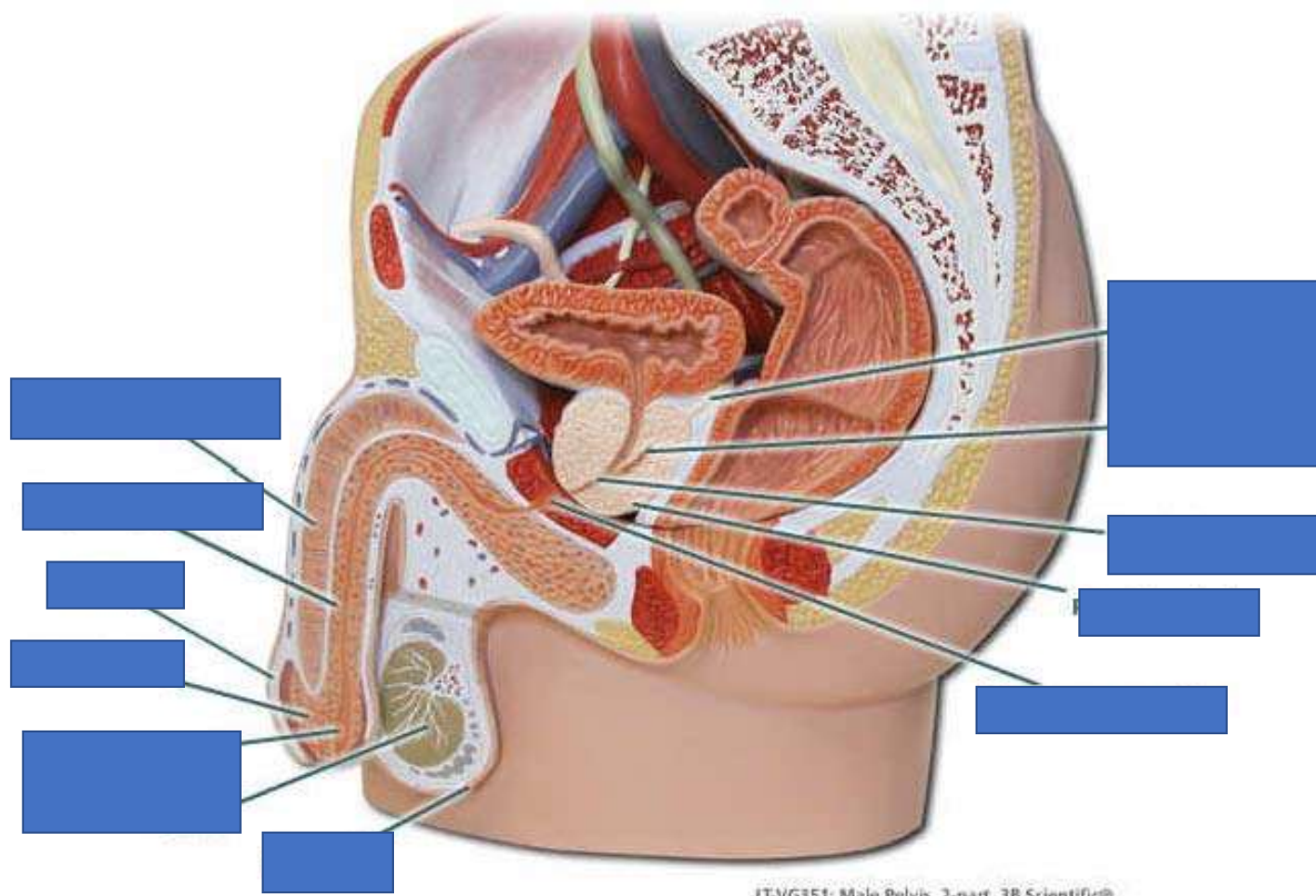
Reproductive organs of the male, intermediate view



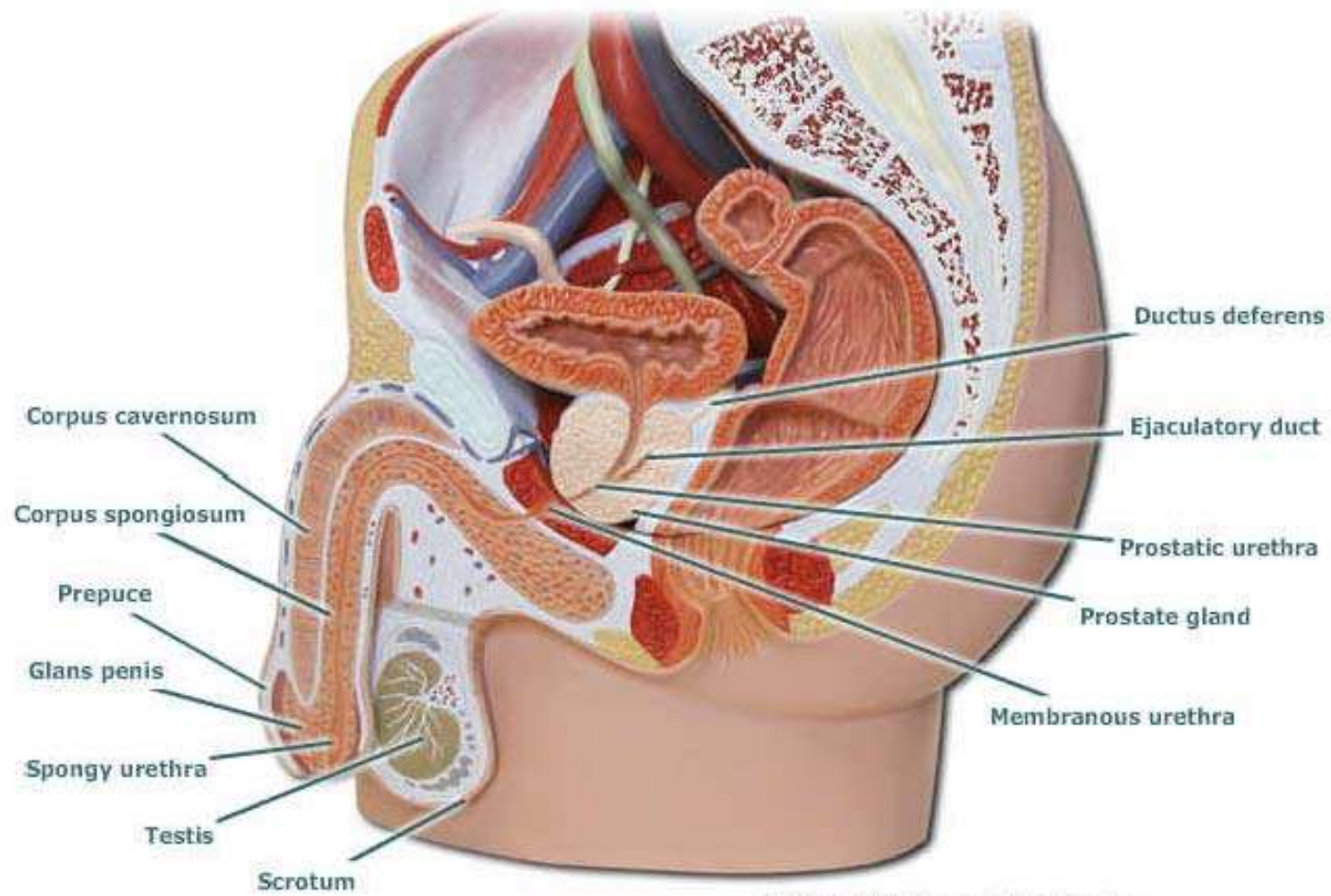
Reproductive organs of the male, intermediate view



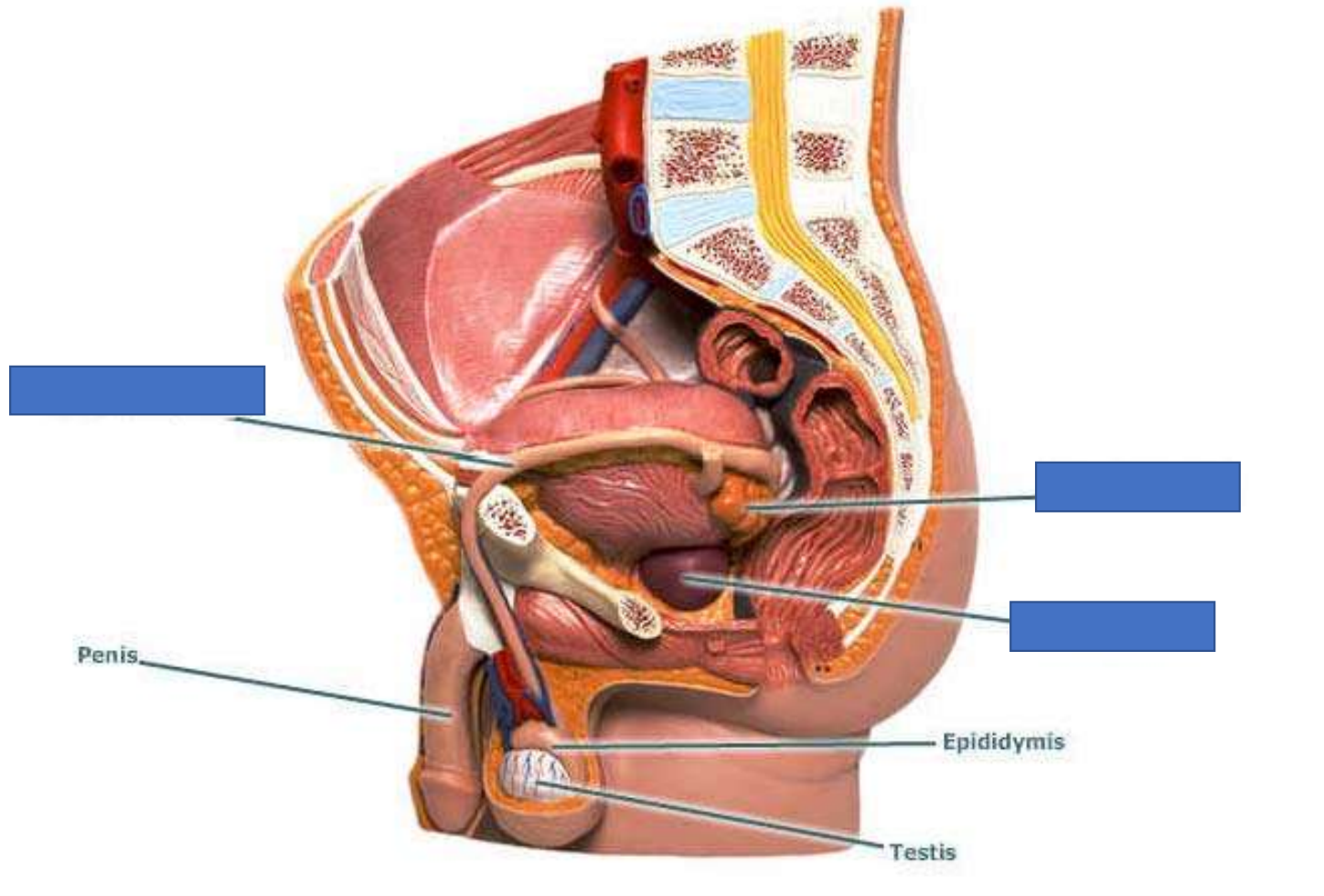
Reproductive organs of the male, deep view



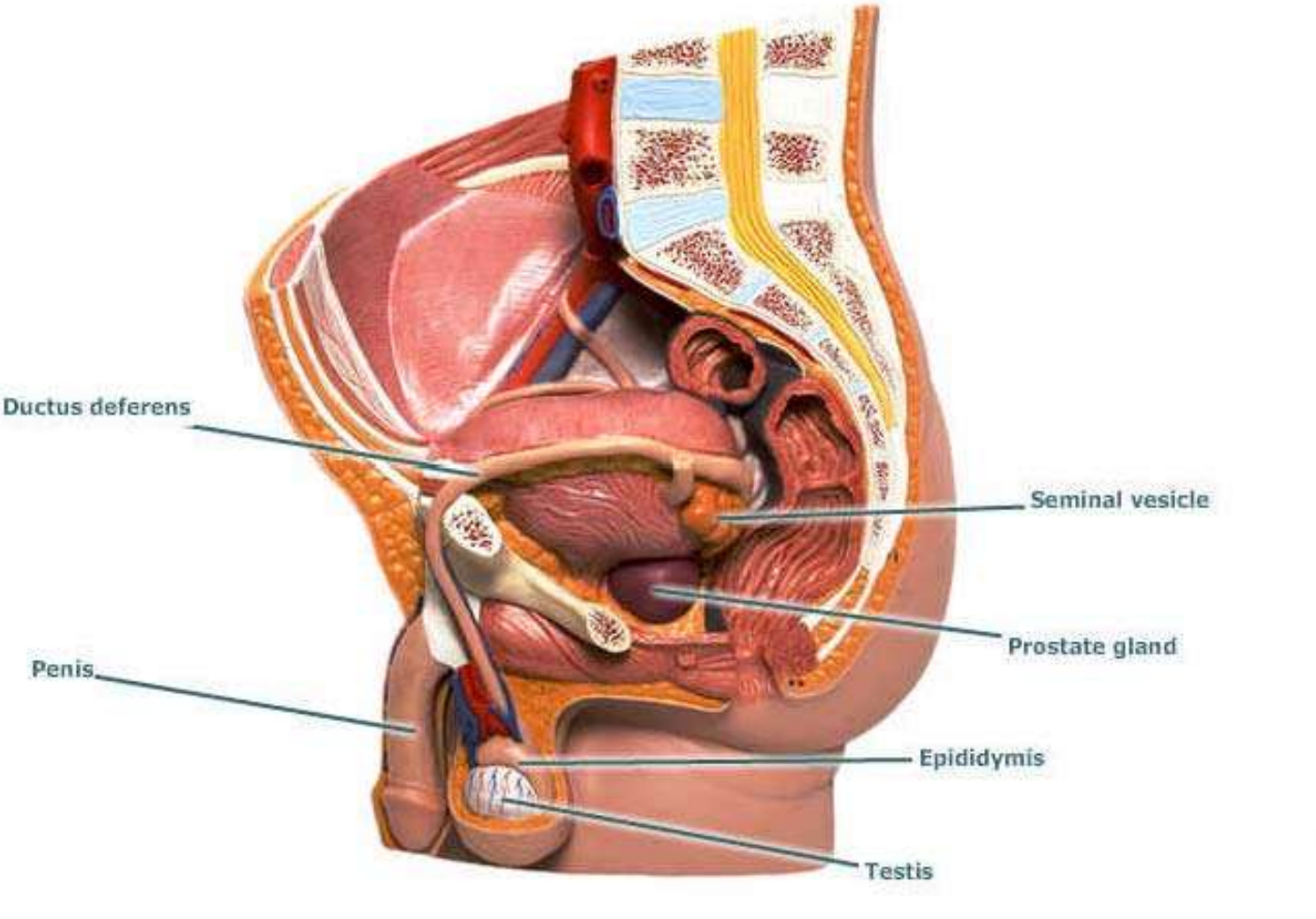
Reproductive organs of the male, deep view

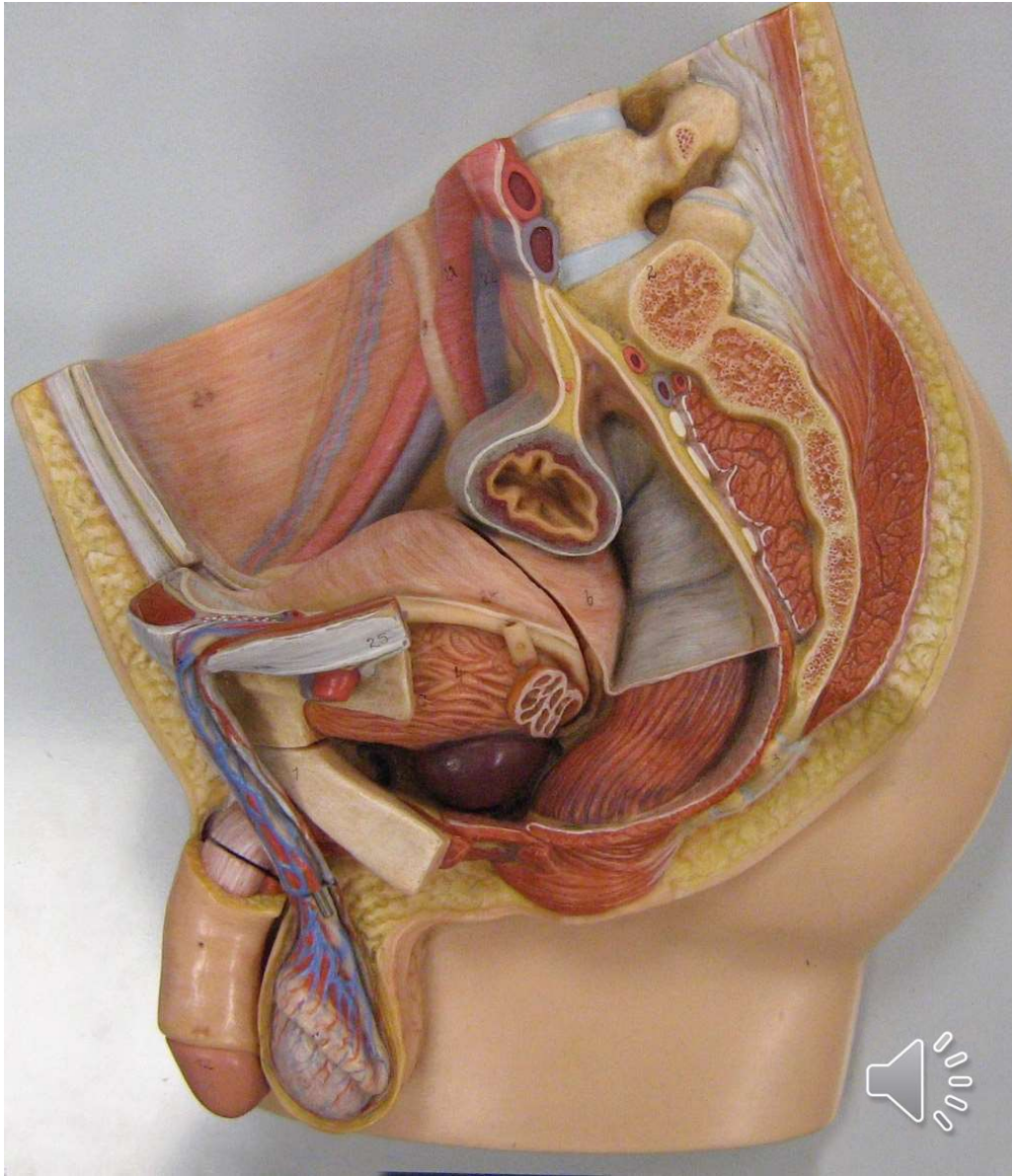
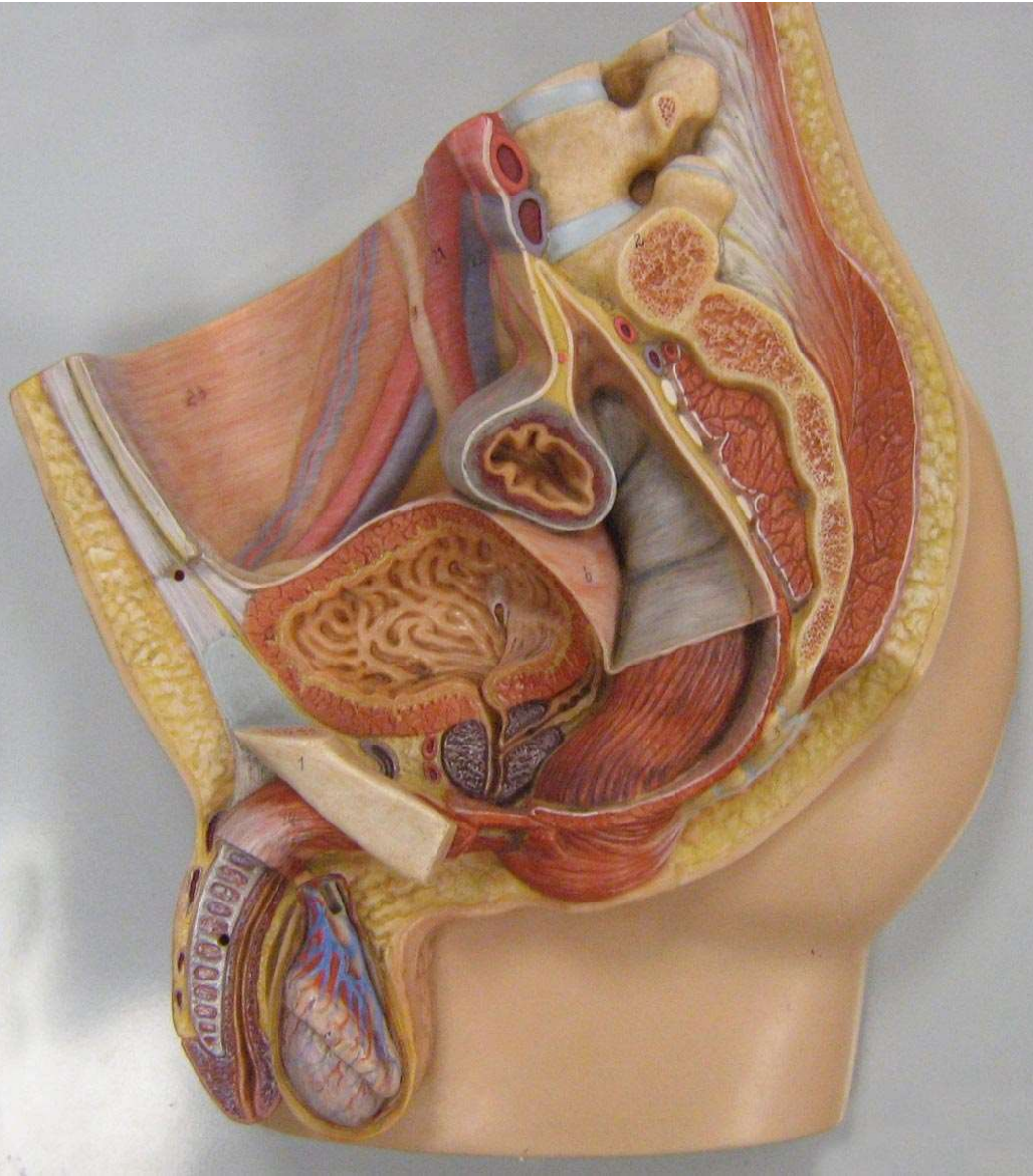


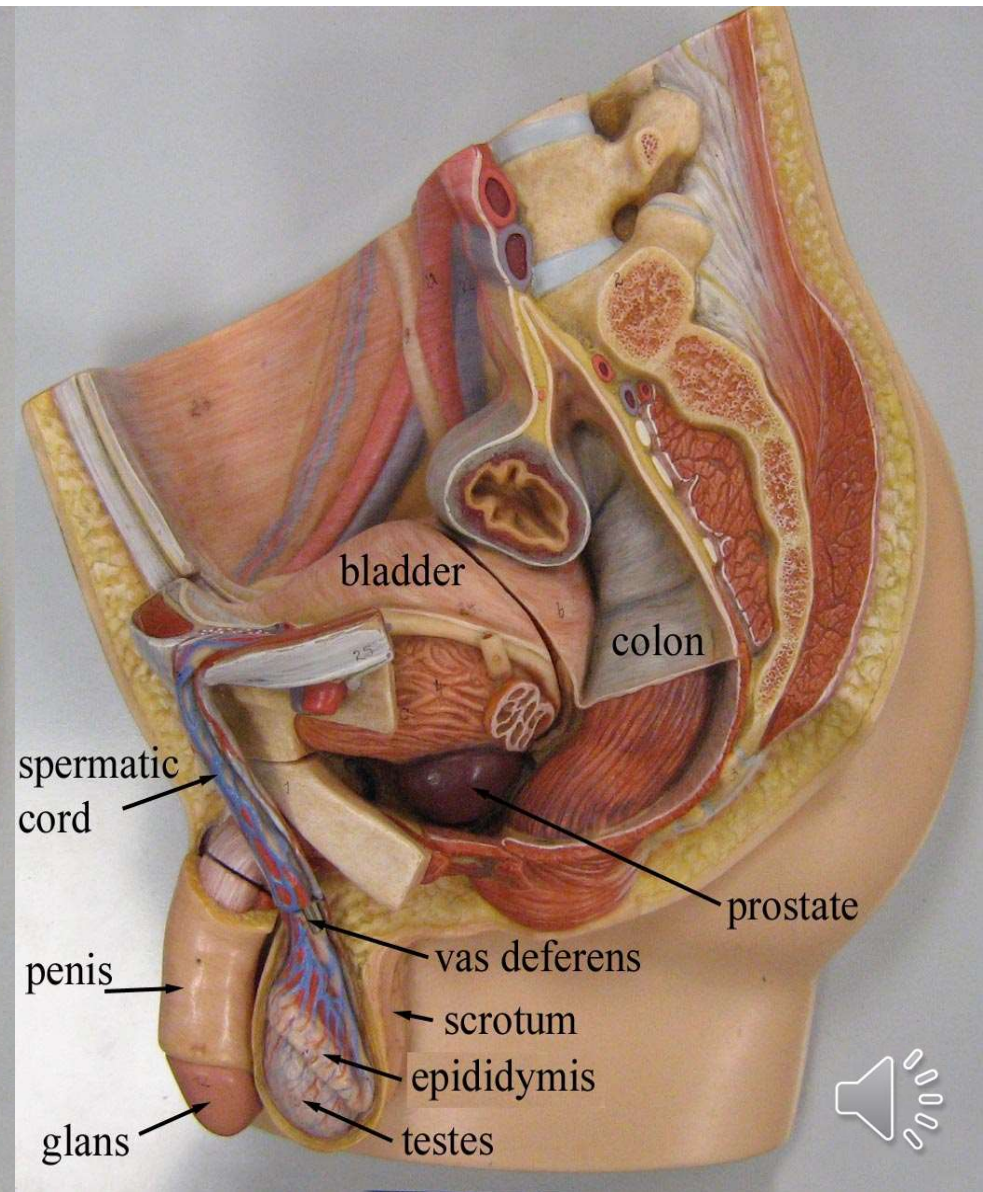
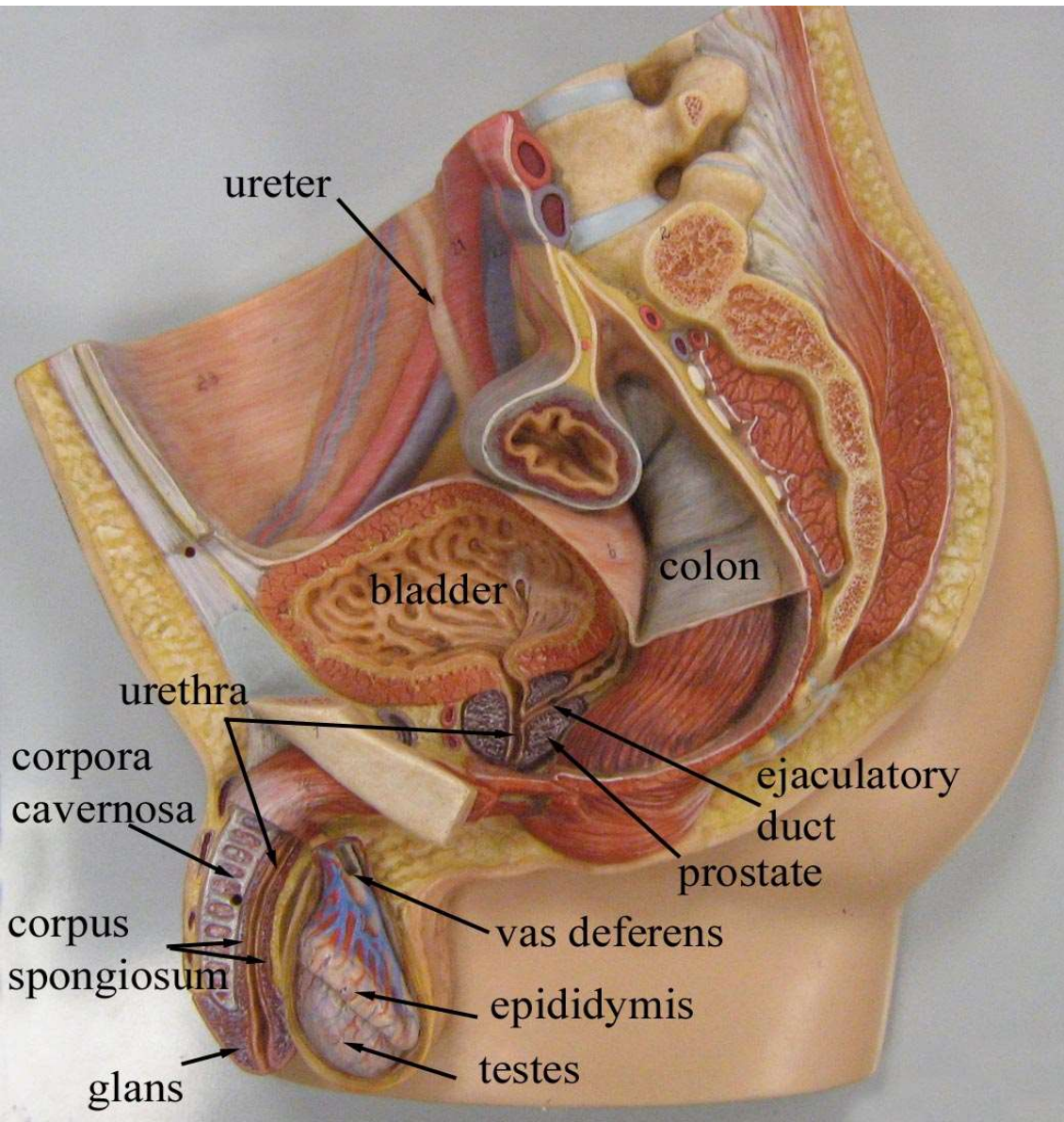
Reproductive organs of the male

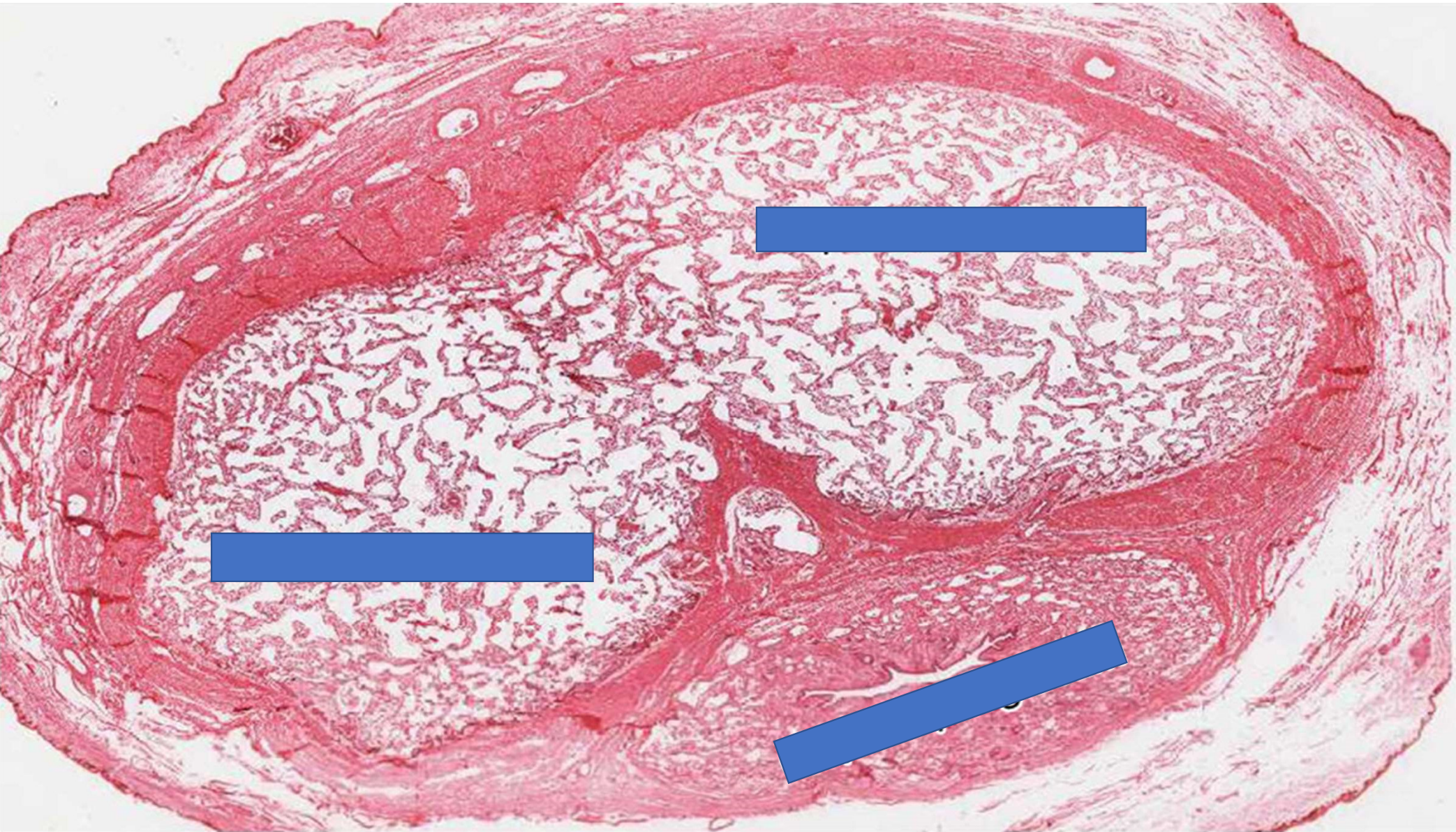


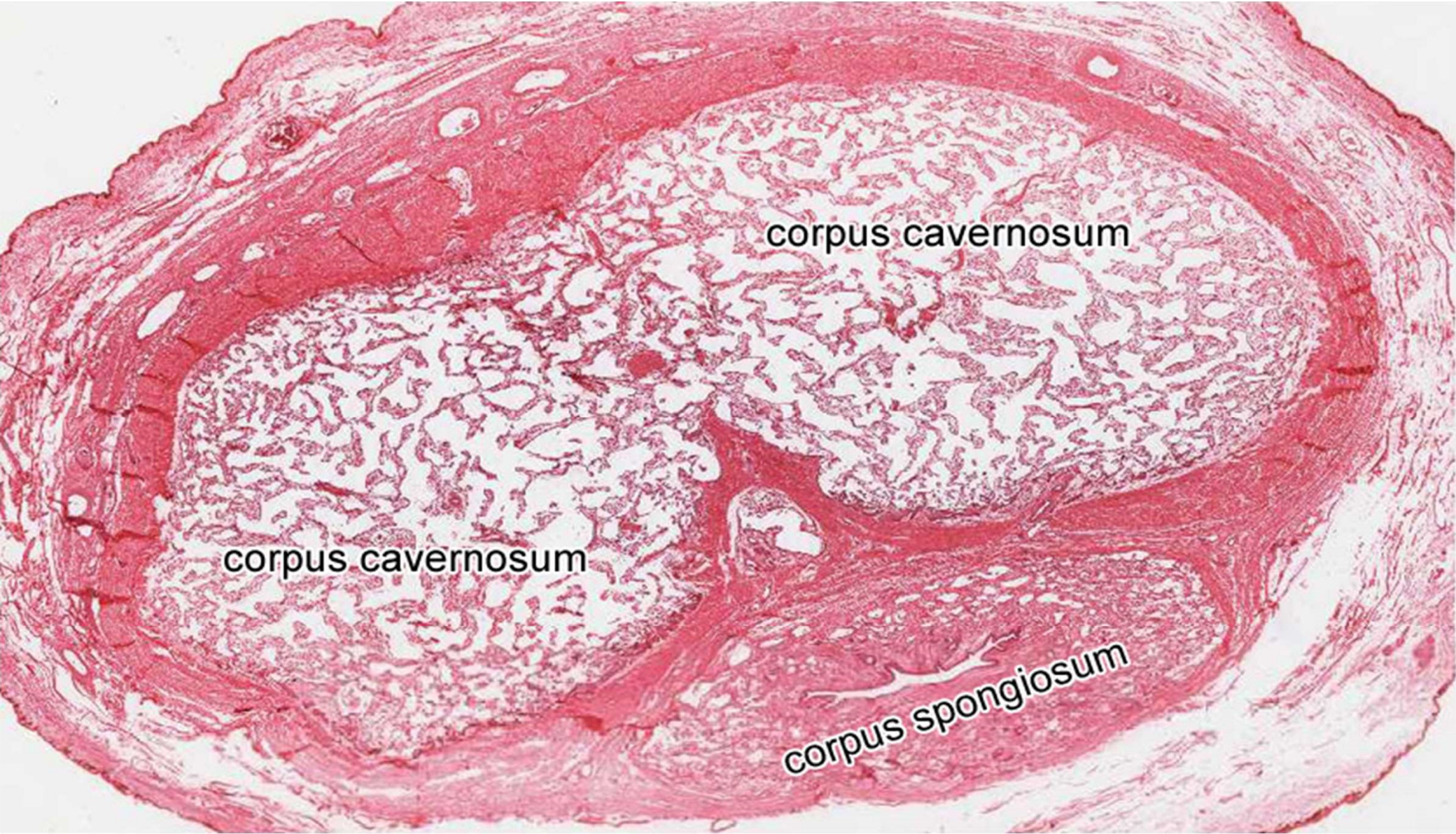
Reproductive organs of the male







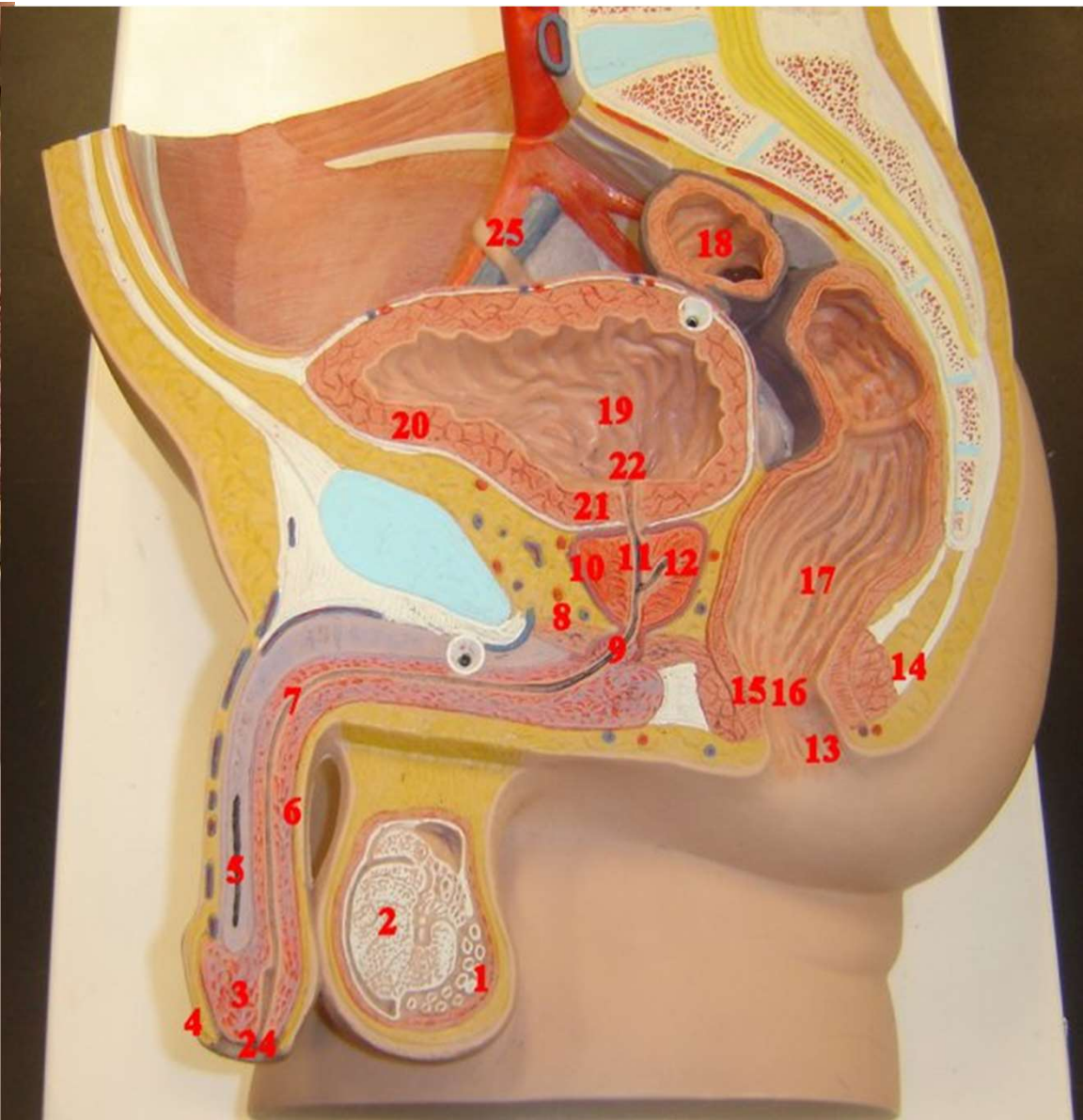
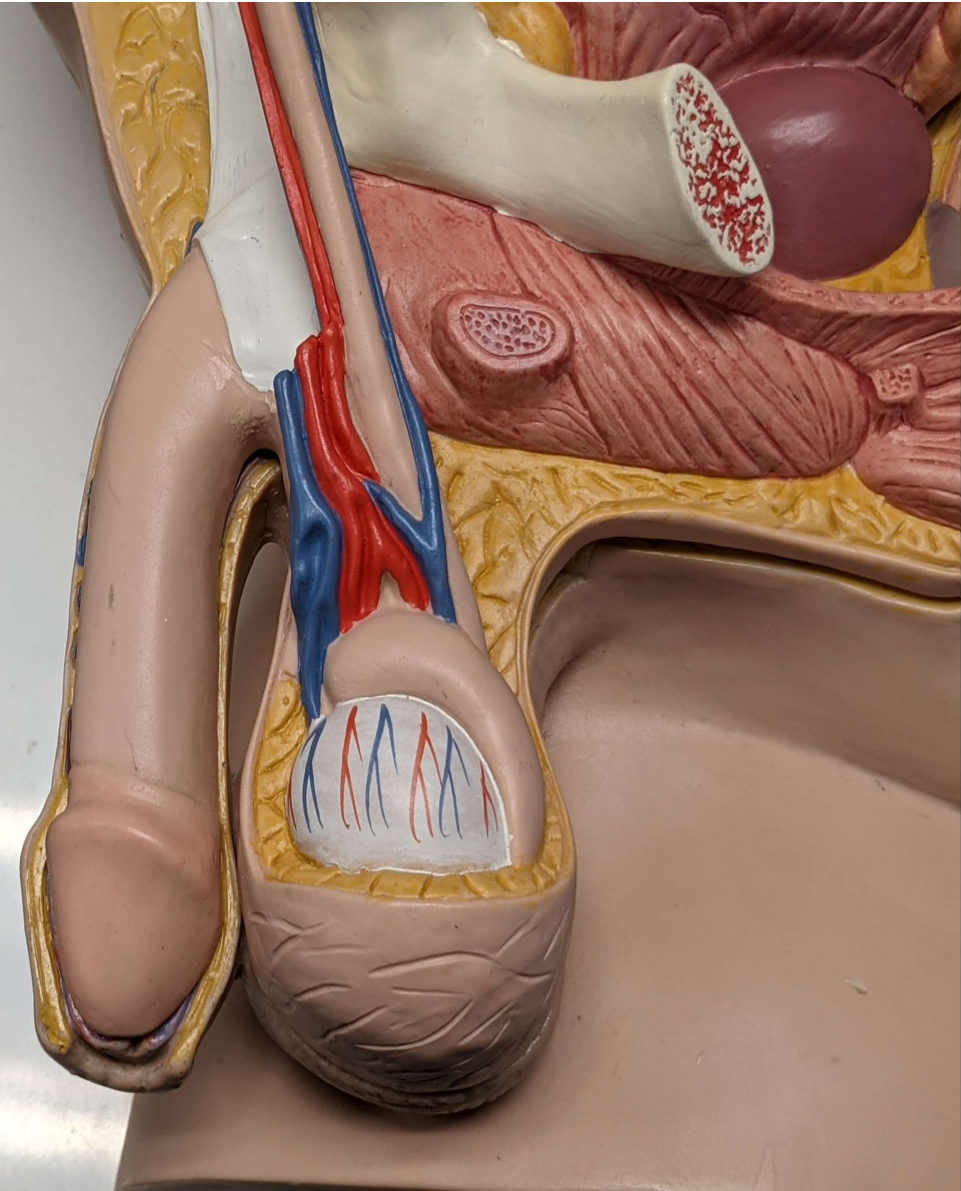


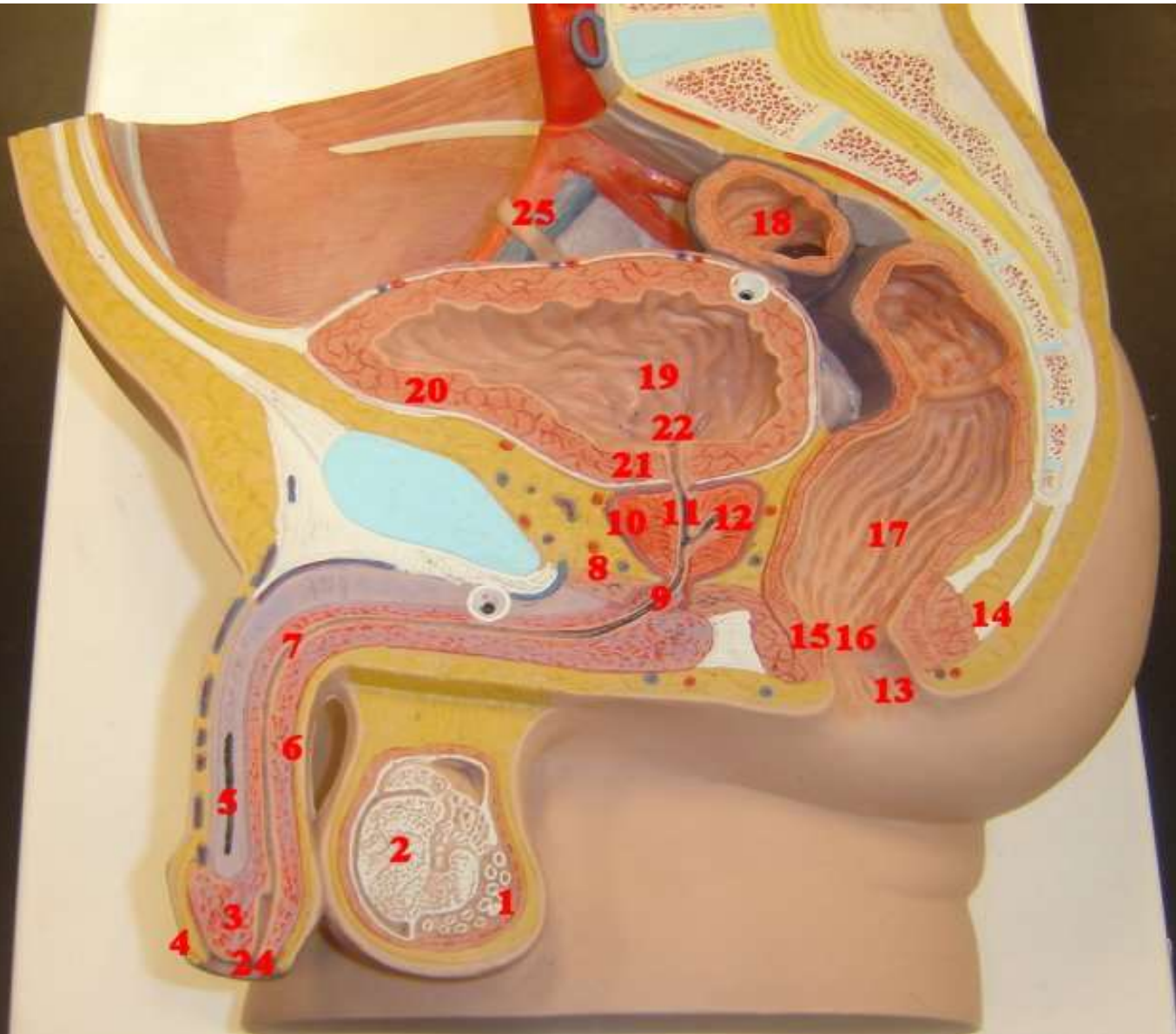


corpus cavernosum

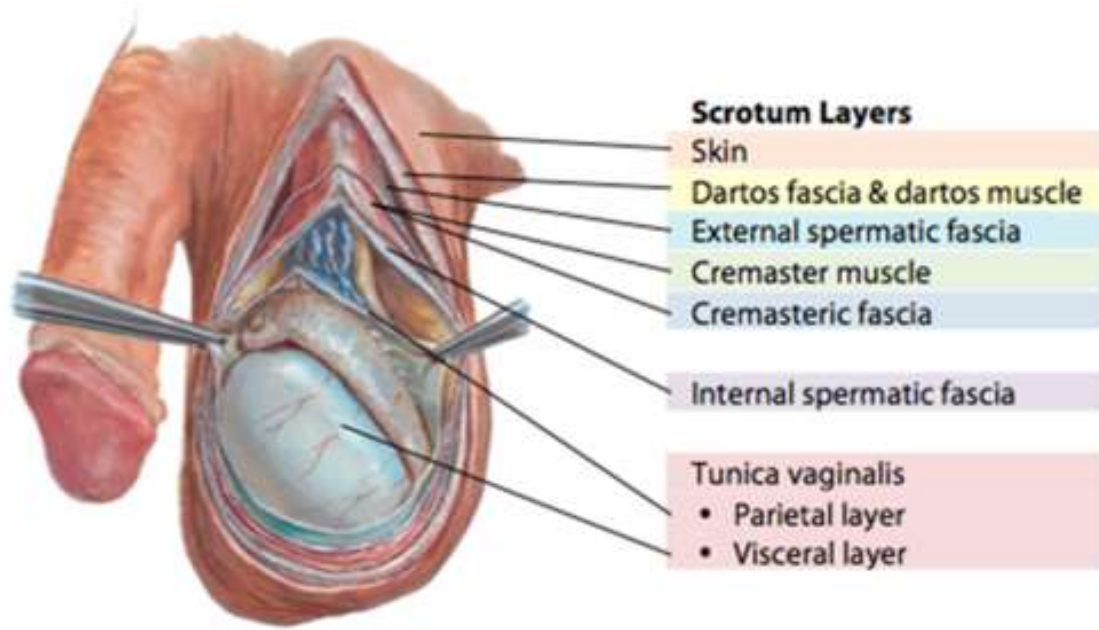
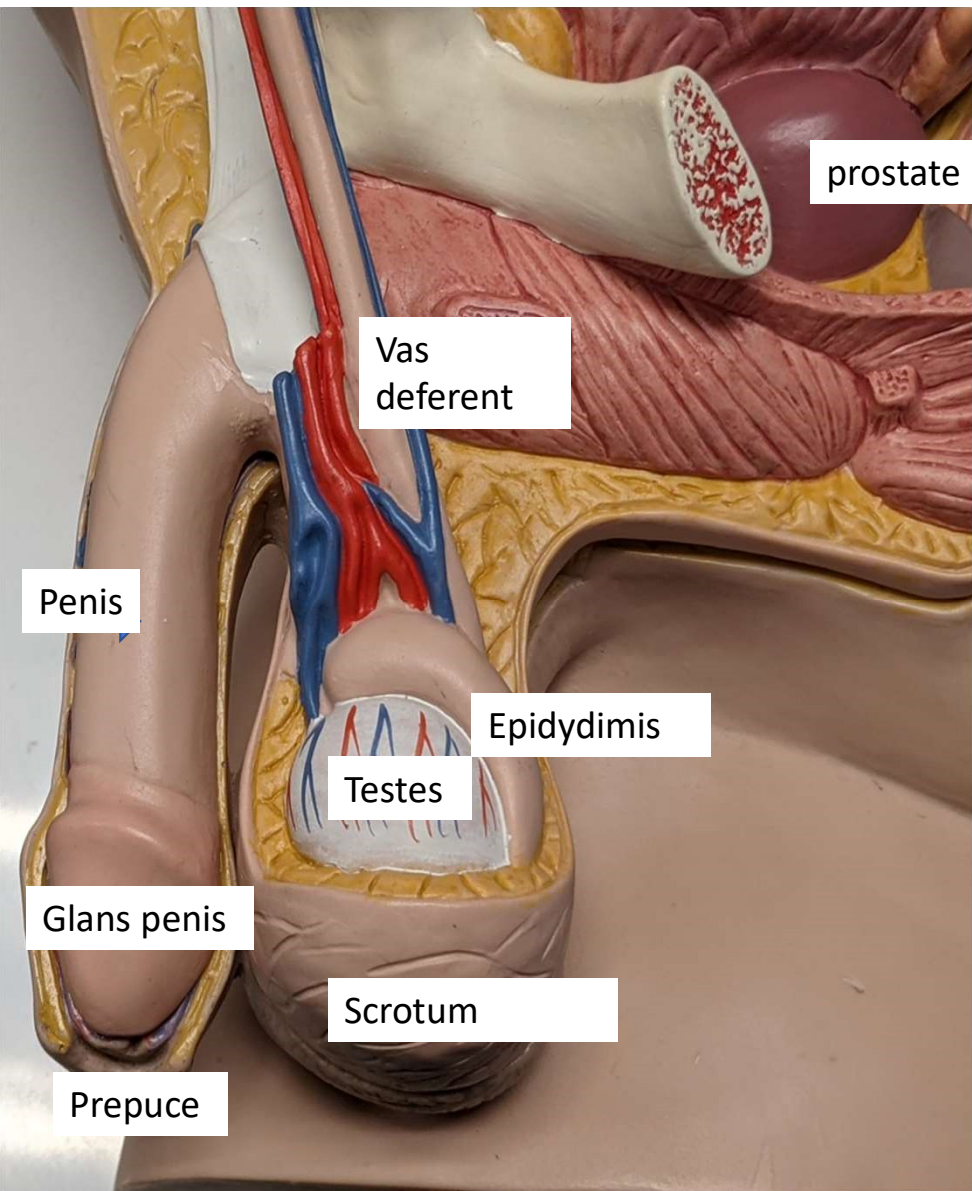
corpus cavernosum

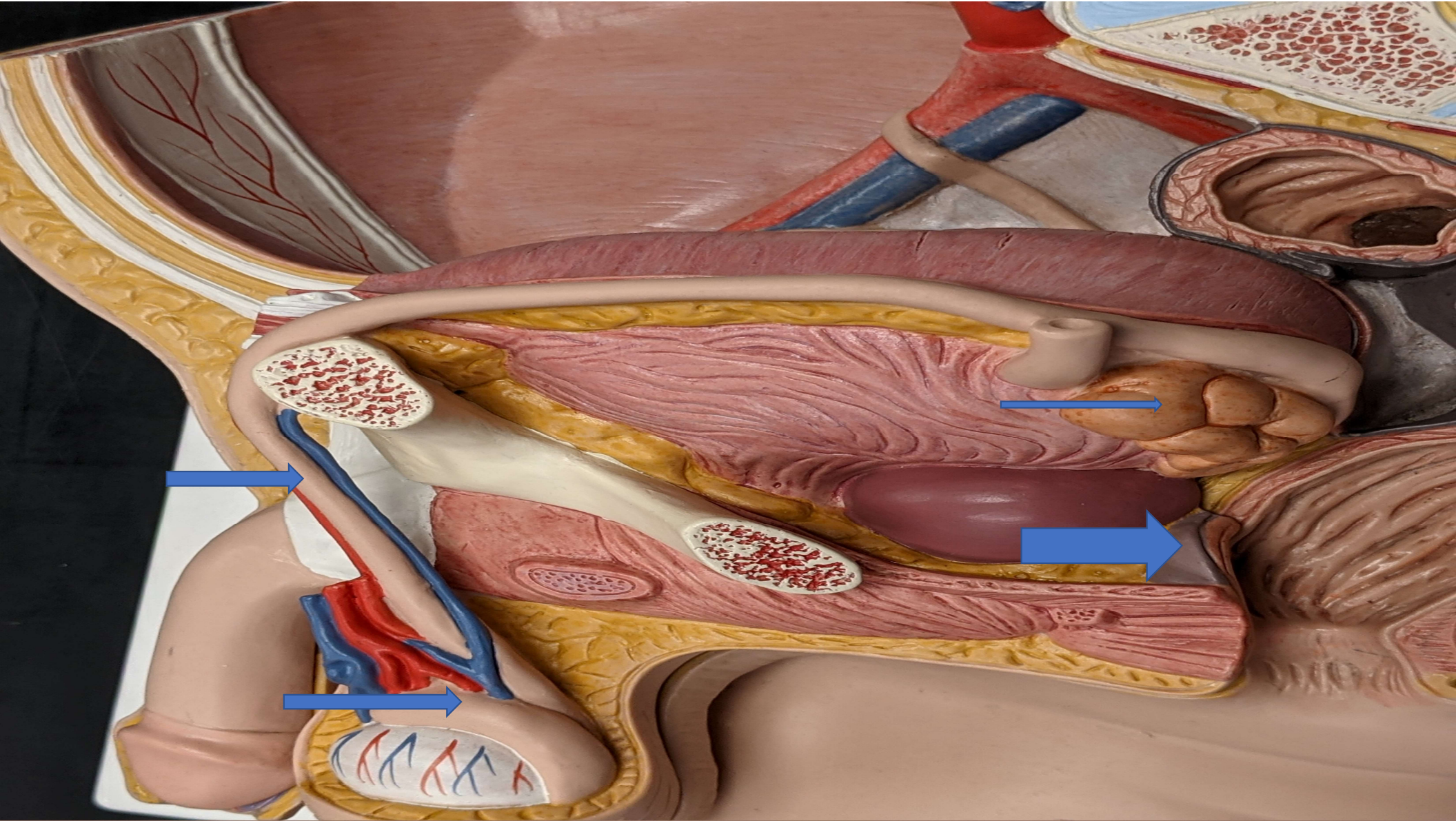
corpus spongiosum

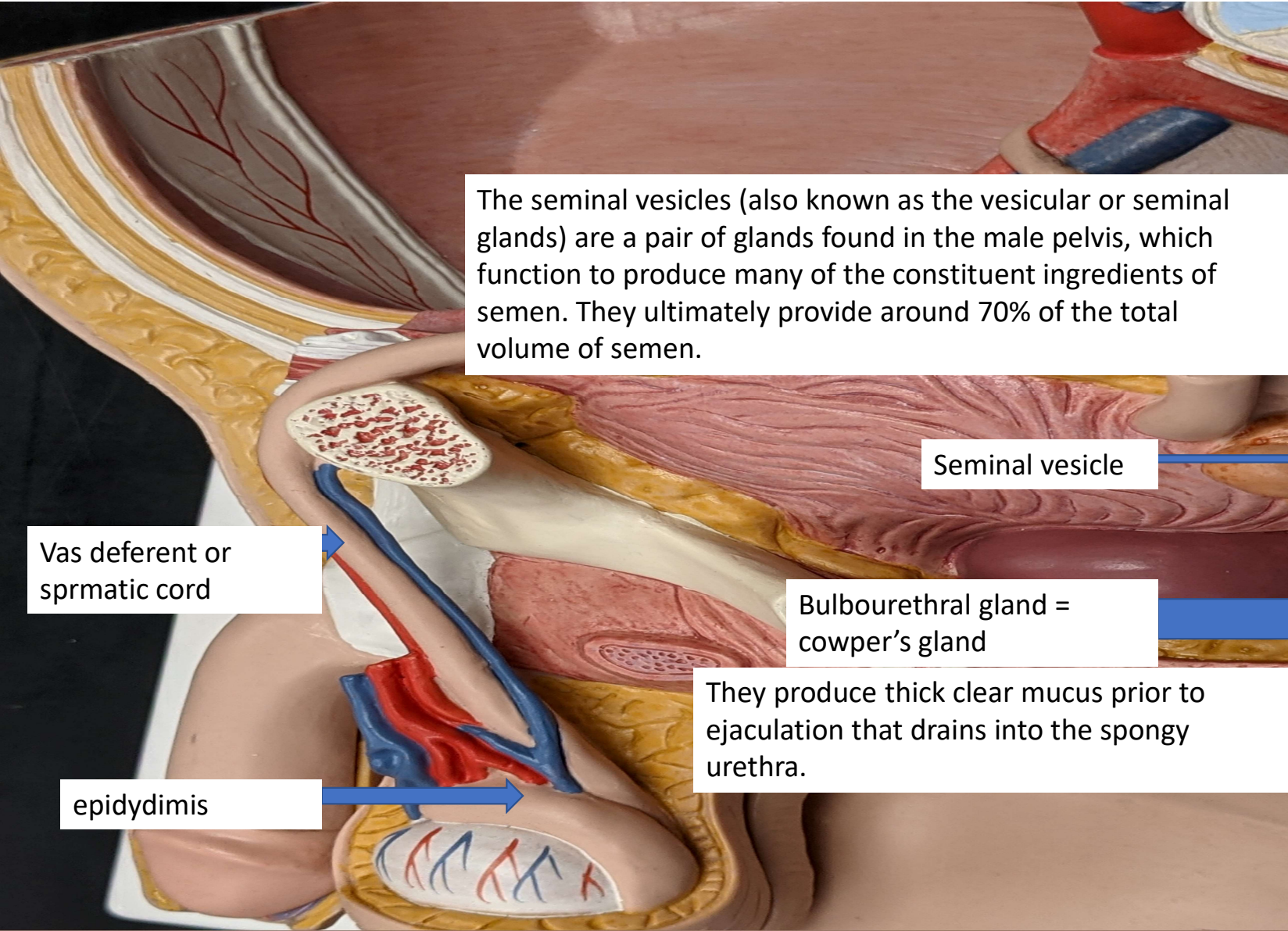




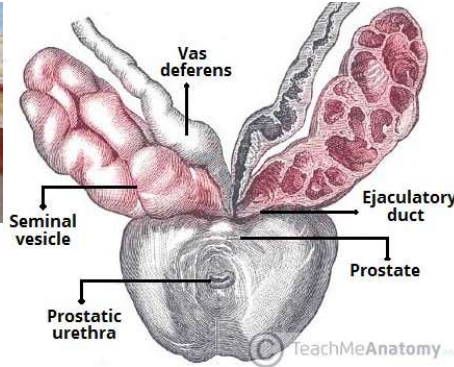
1. Epididymis
2. Seminiferous tubules of testis
3. Glans penis
4. Prepuce
5. Corpus cavernosa
6. Corpus spongiosum
7. Spongy/penile urethra
8. Urogenital diaphragm
9. Membranous urethra
10. Prostate gland
11. Prostatic urethra
12. Ejaculatory duct
13. Anus
14. External anal sphincter
15. Internal anal sphincter
16. Anal canal
17. Rectum
18. Sigmoid colon
19. Rugae within urinary bladder
20. Detrusor muscle
21. Internal urethral sphincter
22. Internal urethral orifice
23. Ureter
24. External urethral orifice



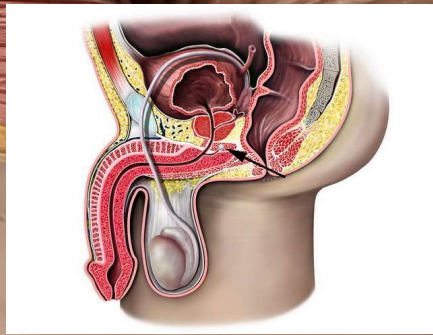




The seminal vesicles (also known as the vesicular or seminal glands) are a pair of glands found in the male pelvis, which function to produce many of the constituent ingredients of semen. They ultimately provide around 70% of the total volume of semen.



They produce thick clear mucus prior to ejaculation that drains into the spongy urethra.



The secretions of **the seminal gland** have a key role in the normal functioning of semen, making up 70% of its total volume.

It is notable however that the first fractions of expelled semen contain mainly spermatozoa and prostatic secretions; the fluids from the seminal vesicles are included in the late ejaculate fractions. These fluids contain:

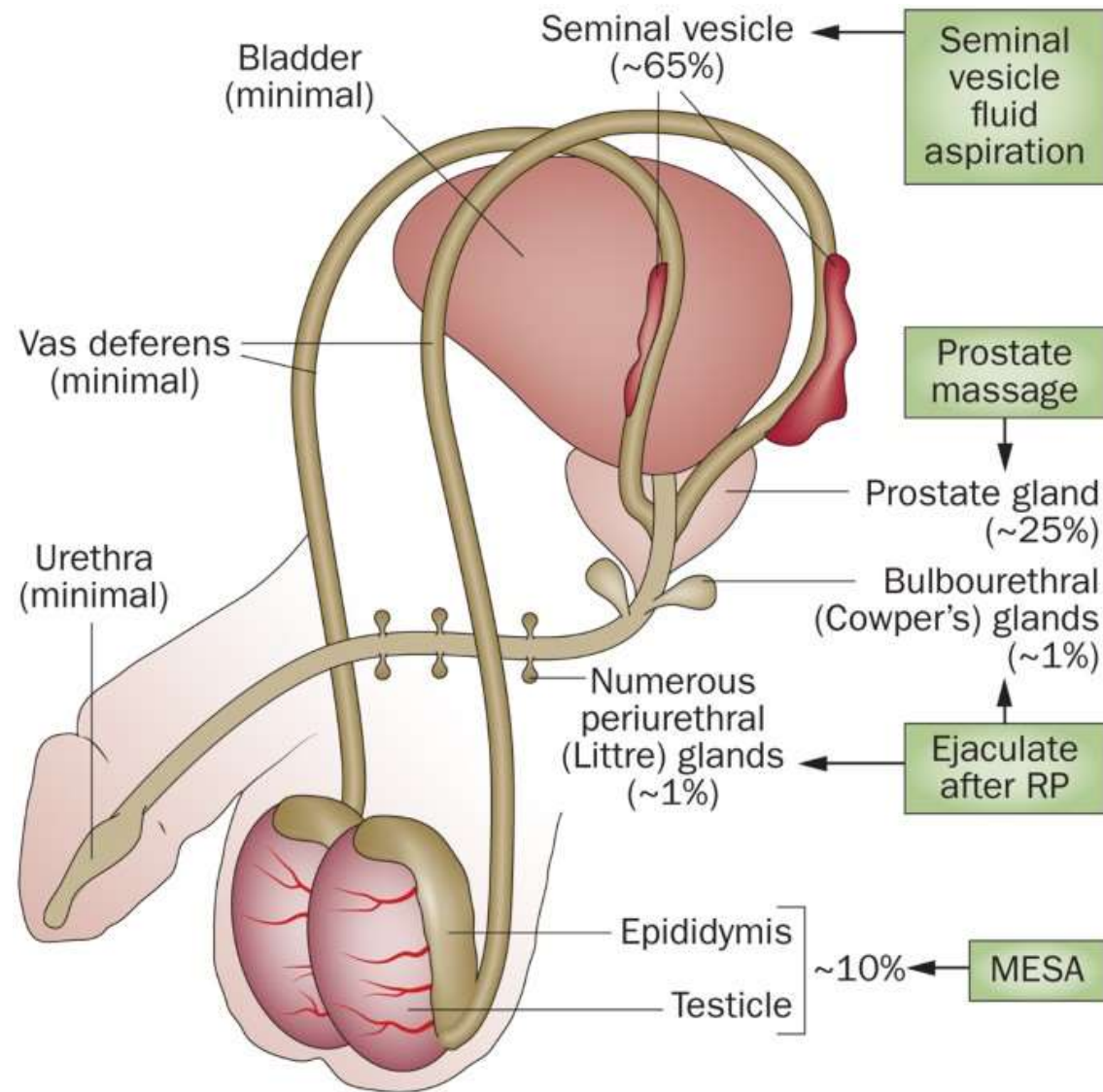
Alkaline fluid – neutralises the acidity of the male urethra and vagina in order to facilitate the survival of spermatozoa.

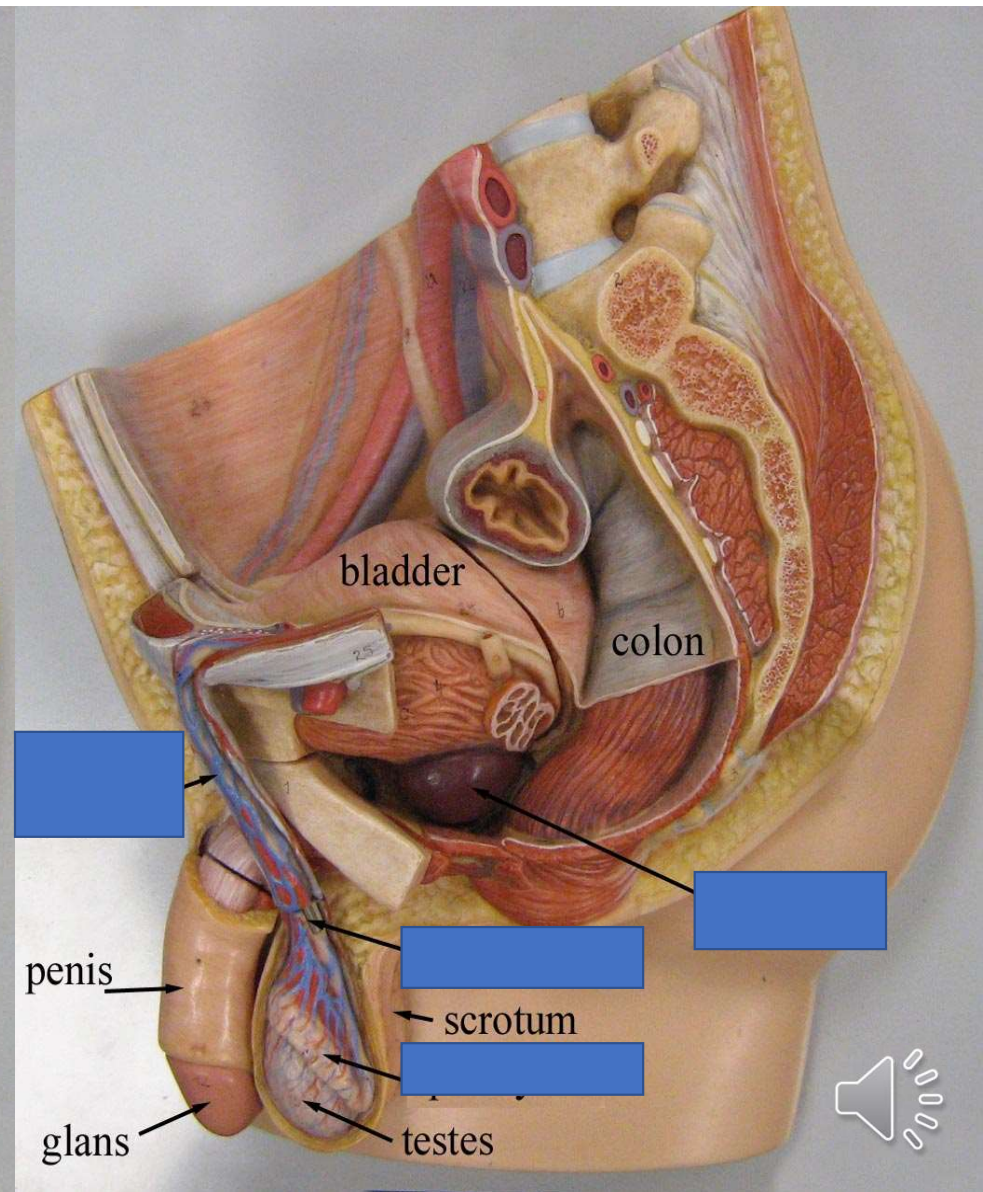
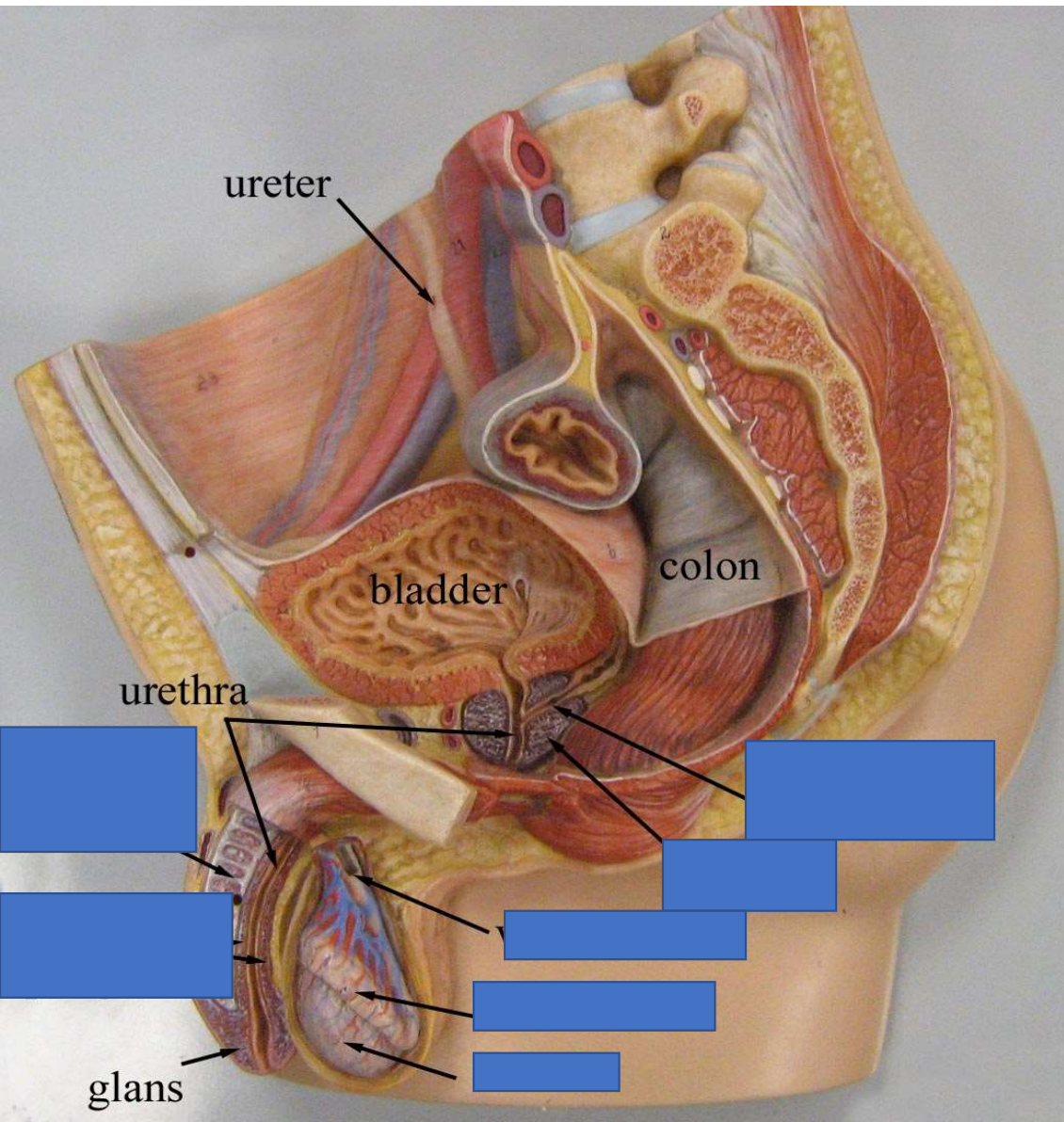
Fructose – provides an energy source for spermatozoa.

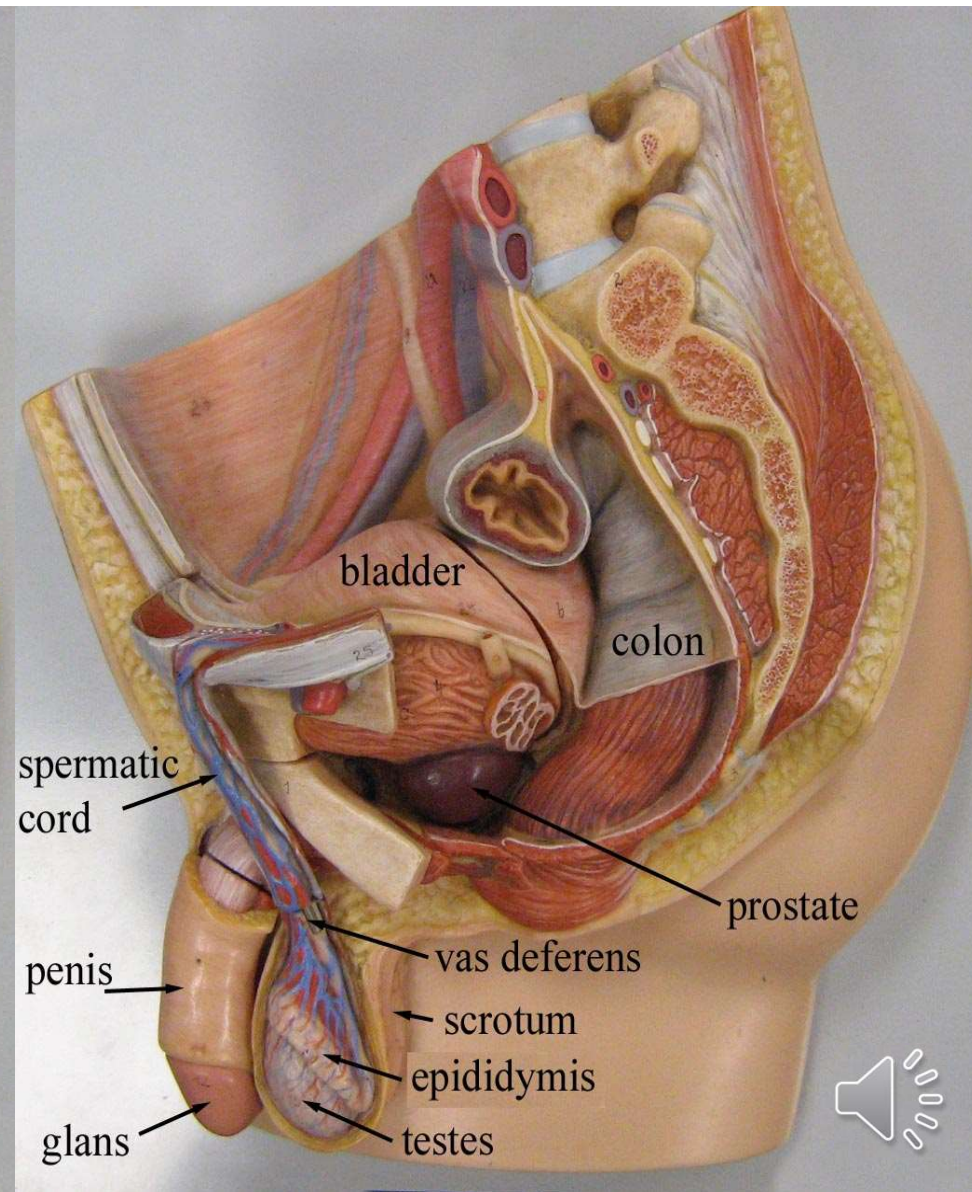
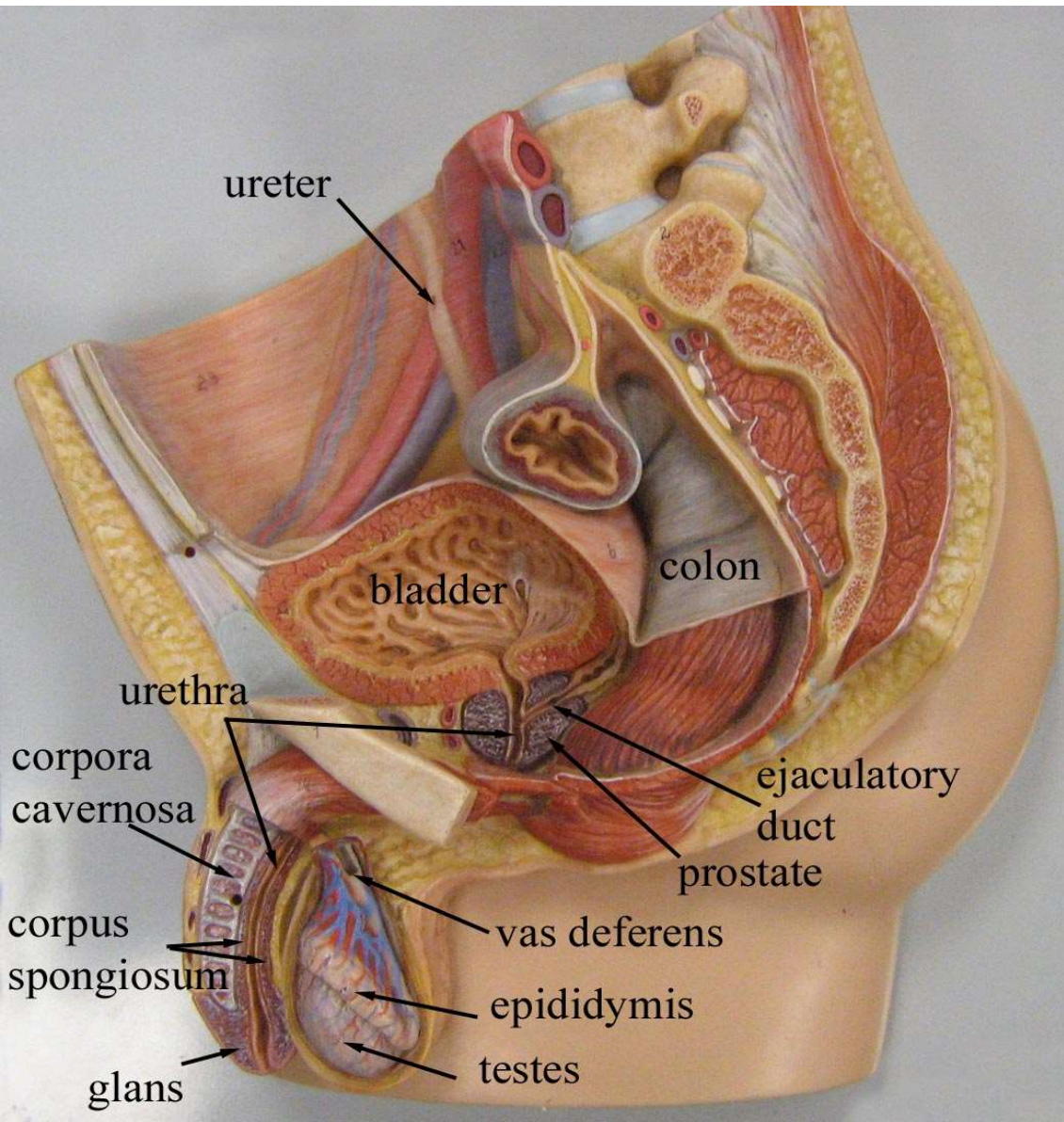
Prostaglandins – have a role in suppressing the female immune response to foreign semen.

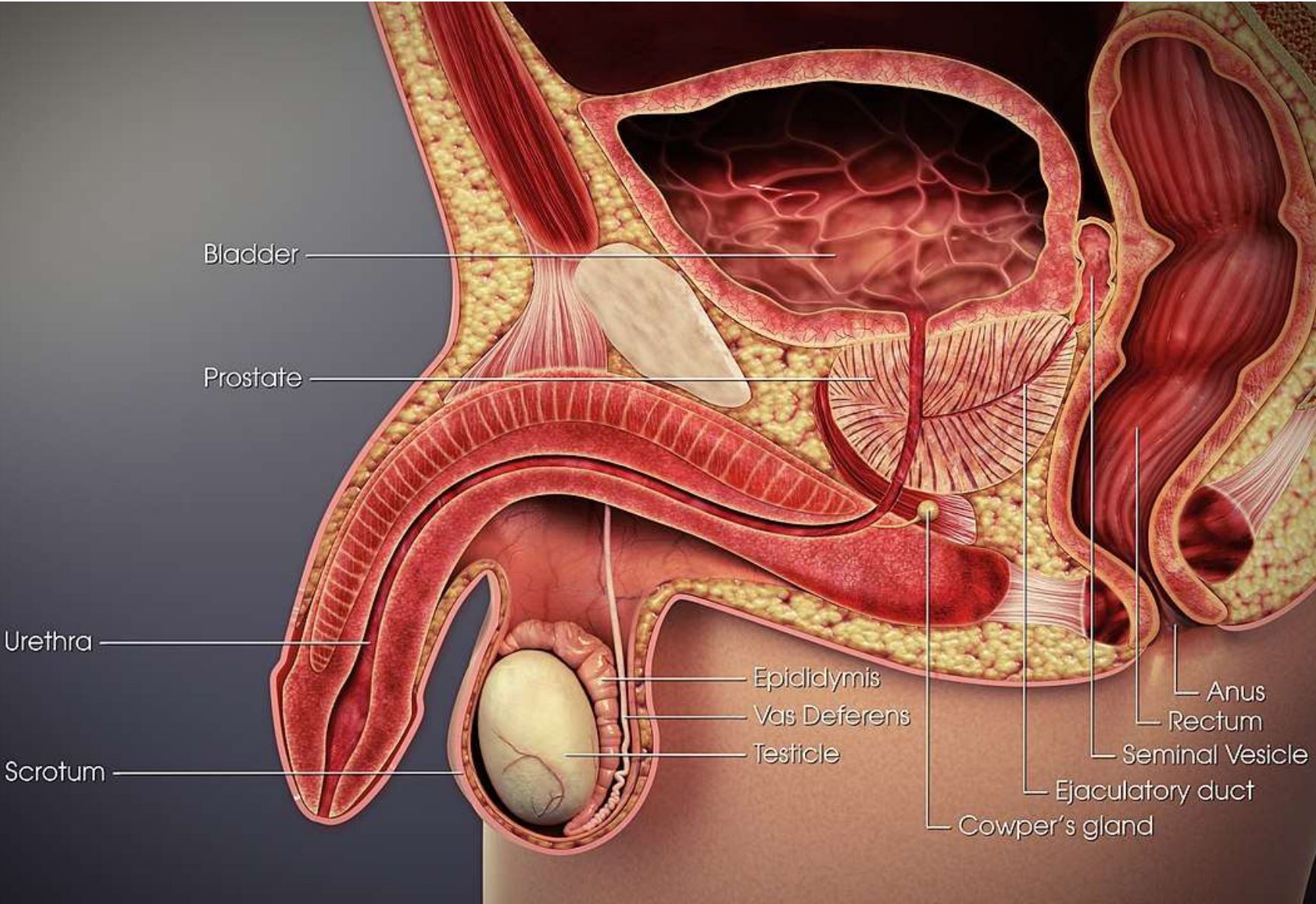
Clotting factors – designed to keep semen in the female reproductive tract post-ejaculation.

The remaining volume of semen is made up of testicular **spermatozoa**, prostatic secretions and mucus from the bulbourethral gland.

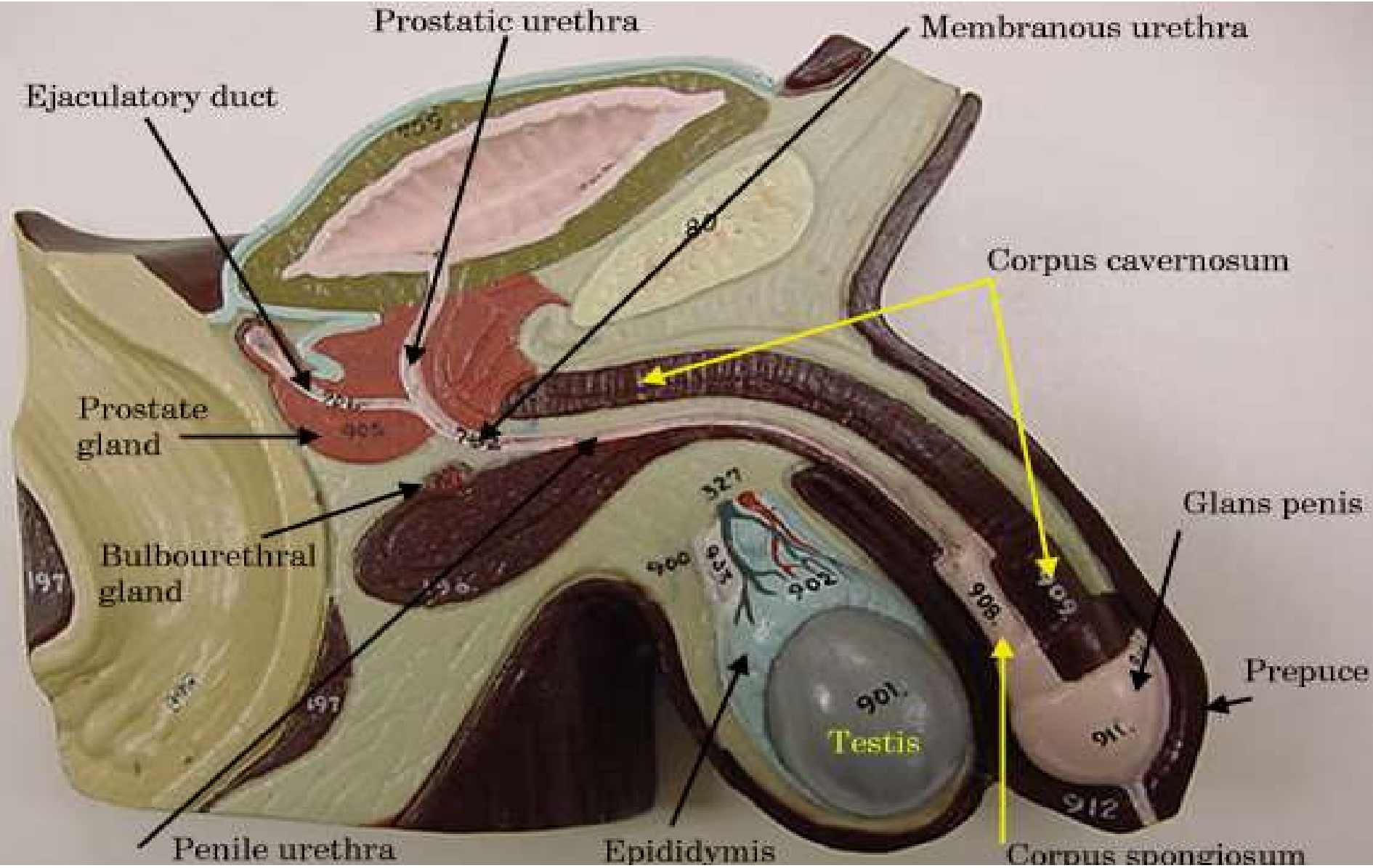


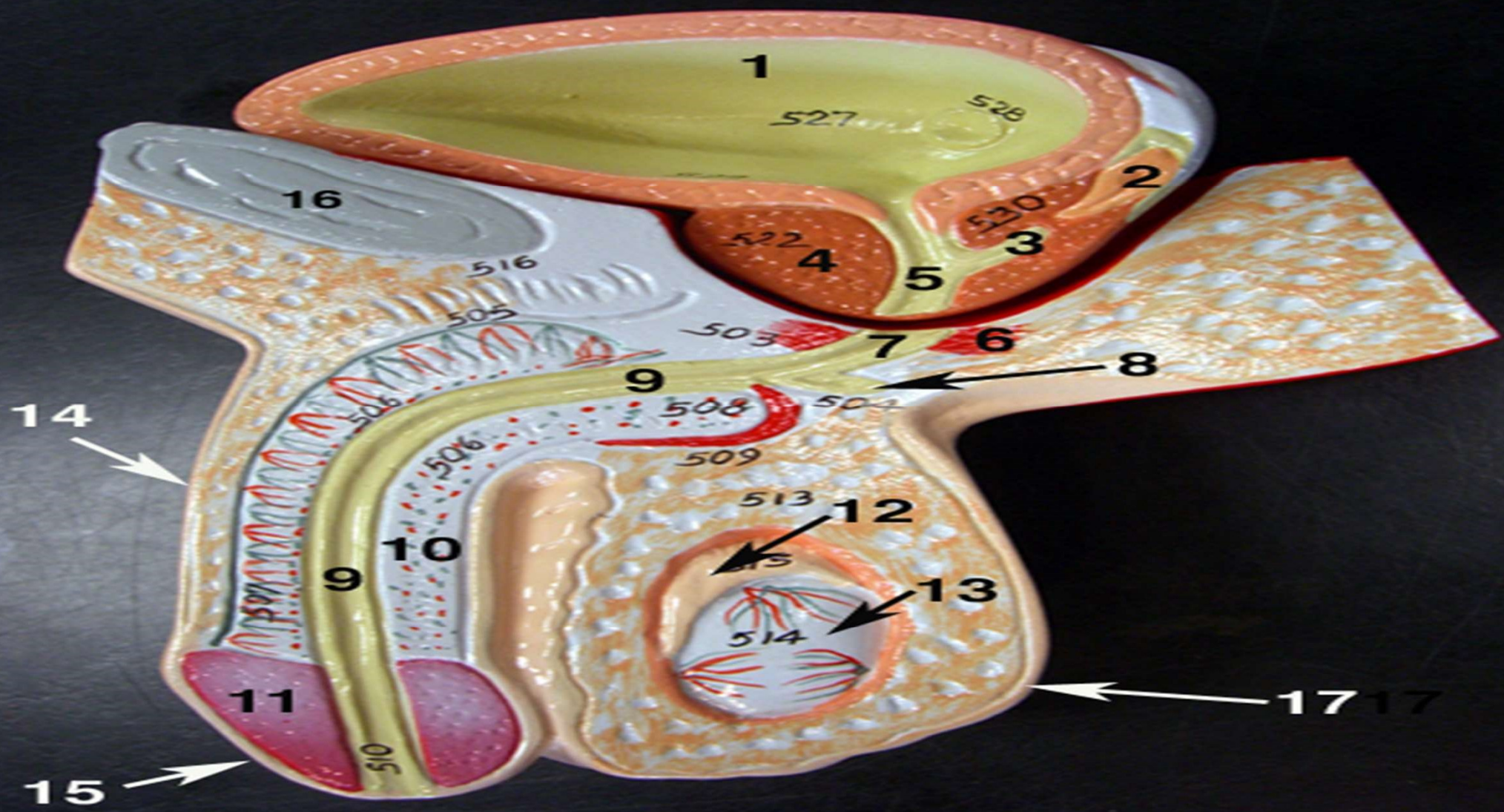


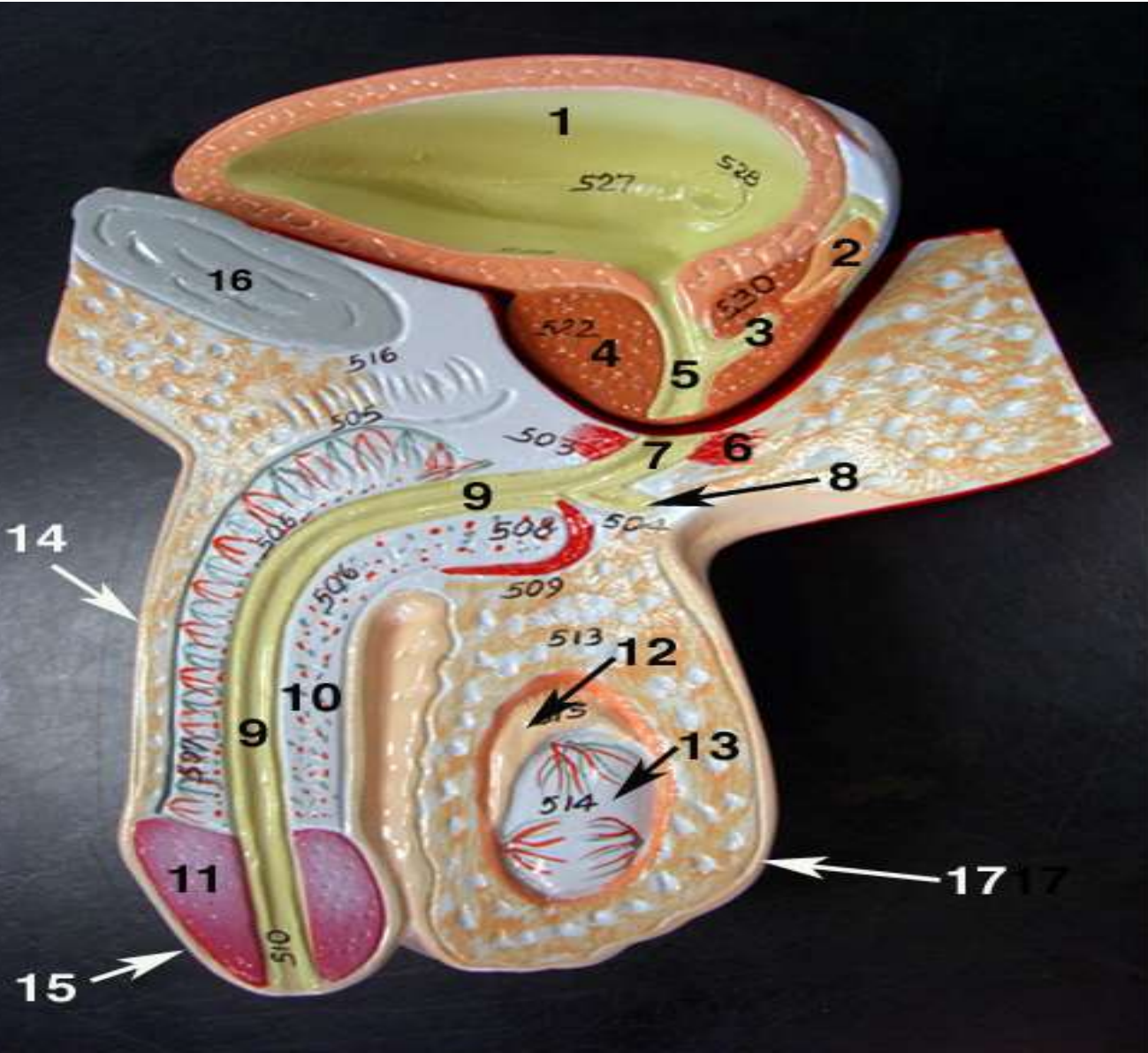












1. Urinary bladder
2. Ampulla of vas deferens
3. Ejaculatory duct
4. Prostate gland
5. Prostatic urethra
6. External urethral sphincter
7. Membranous urethra
8. Bulbourethral gland
9. Penile urethra
10. Corpus spongiosum
11. Glans penis
12. Epididymis
13. Testis
14. Penis
15. Prepuce
16. Pubic bone
17. Scrotum



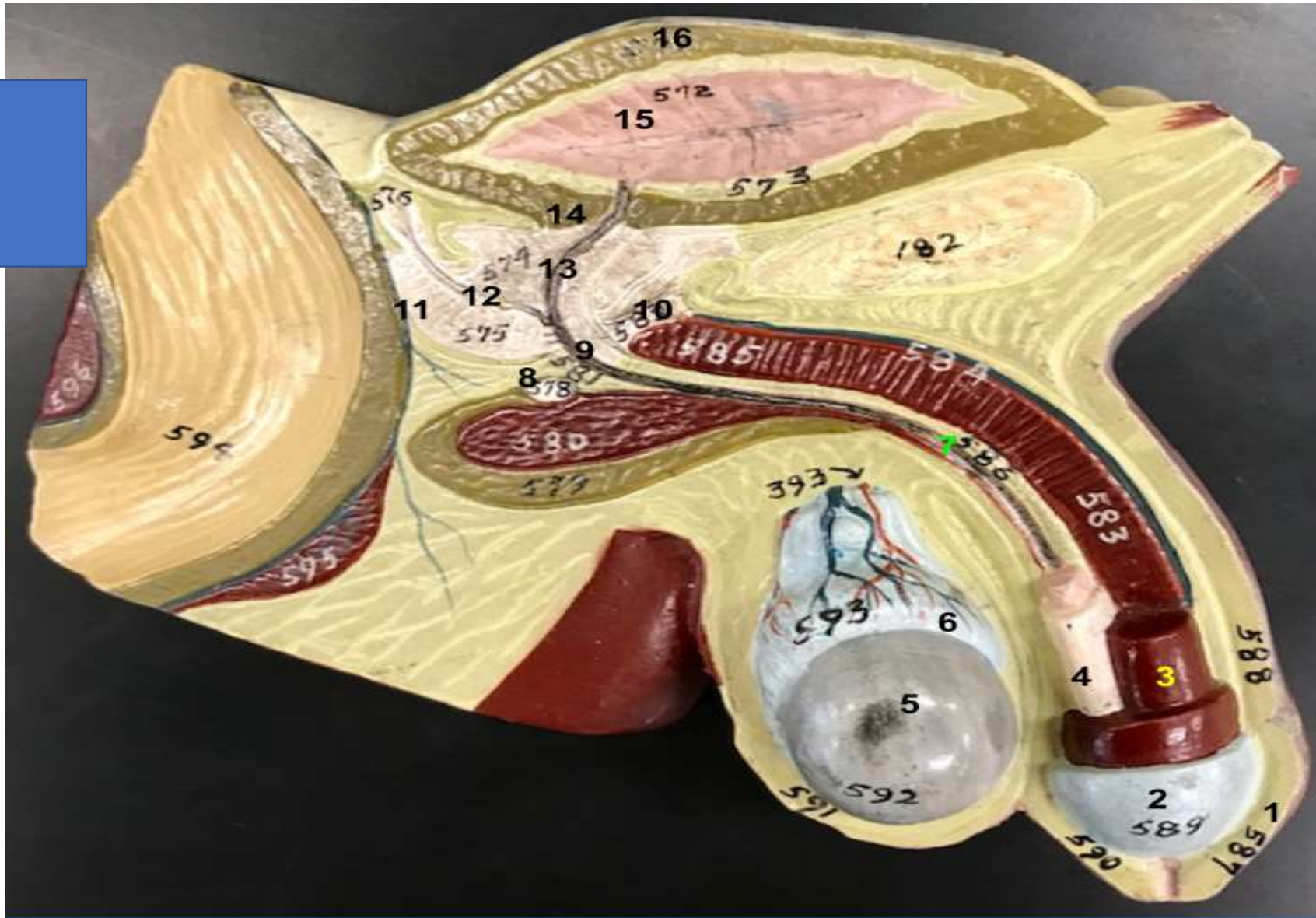


Here we have another model with several structures met previously.

1. Glans penis
2. Testis
3. Epididymis
4. Spermatic cord
5. Vas deferens
6. Ureter
7. Urinary bladder
8. Seminal vesicle
9. Prostate gland
10. Urogenital diaphragm
11. Pelvic diaphragm

Note that in this model we see the spermatic cord (4) which is the bundle of vessels, nerves, and the vas deferens that extends from the abdomen to the scrotum.

Name 1-16?

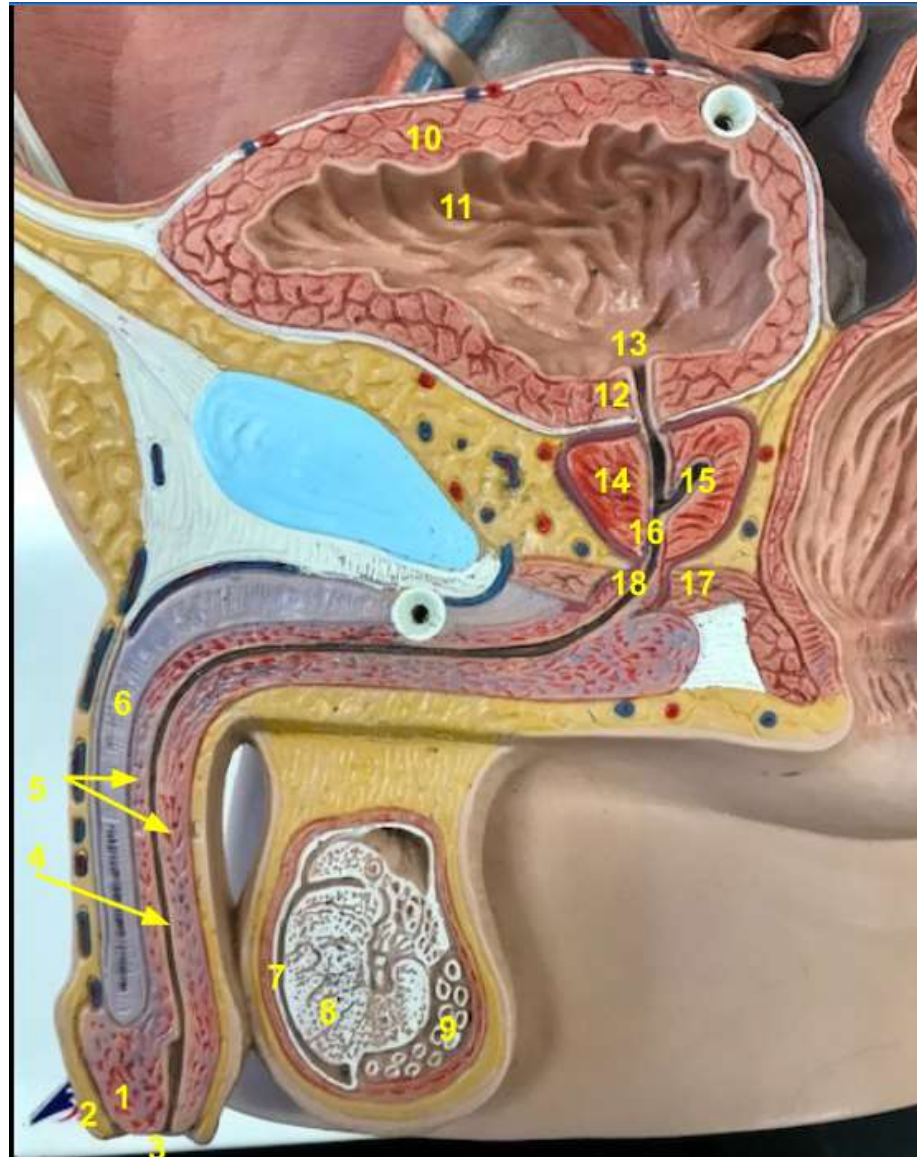


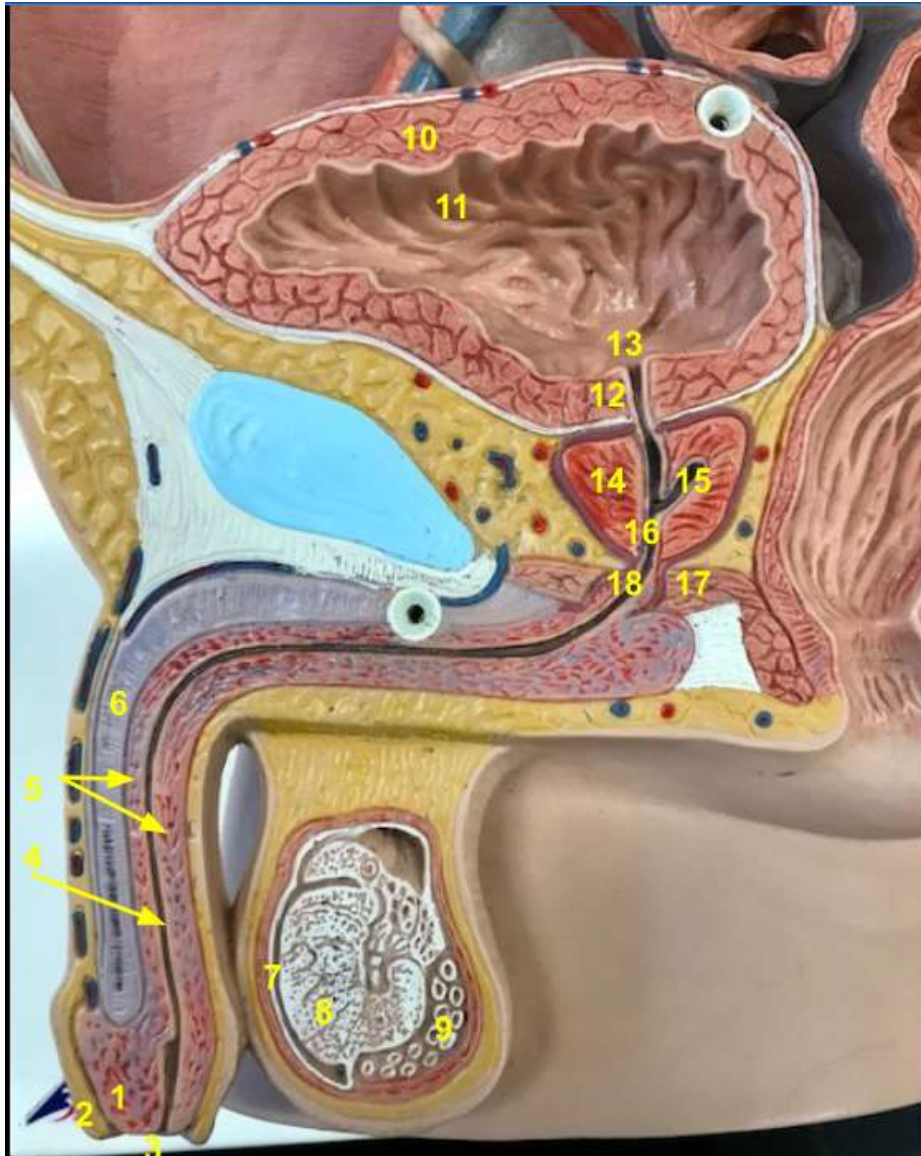


This model shows us several structures met previously.

1. Prepuce
2. Glans penis
3. Corpus cavernosa
4. Corpus spongiosum
5. Testis
6. Epididymis
7. Penile/Spongy urethra
8. Bulbourethral gland
9. Membranous urethra
10. Urogenital diaphragm
11. Prostate gland
12. Ejaculatory duct
13. Prostatic urethra
14. Internal urethral sphincter
15. Urinary bladder with rugae
16. Detrusor muscle

Name 1-18?





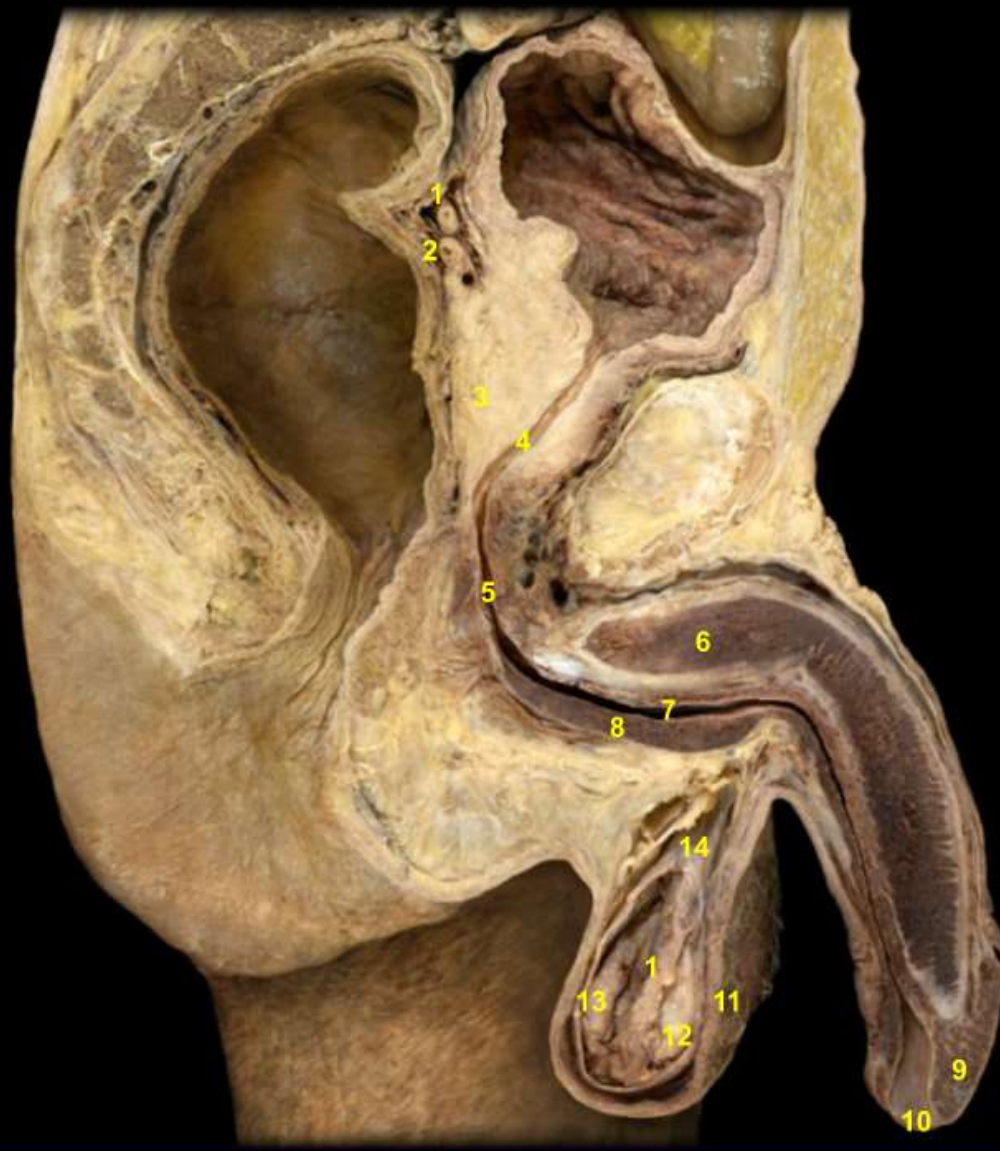
In this view, we can still see the glans penis (1) and prepuce (2) as well as internal penile structures. Note the external urethral orifice (3) at the terminus of the penile/spongy urethra (4). The urethra is enclosed by the corpus spongiosum which is just ventral to the corpora cavernosa (of which we see one (6)).

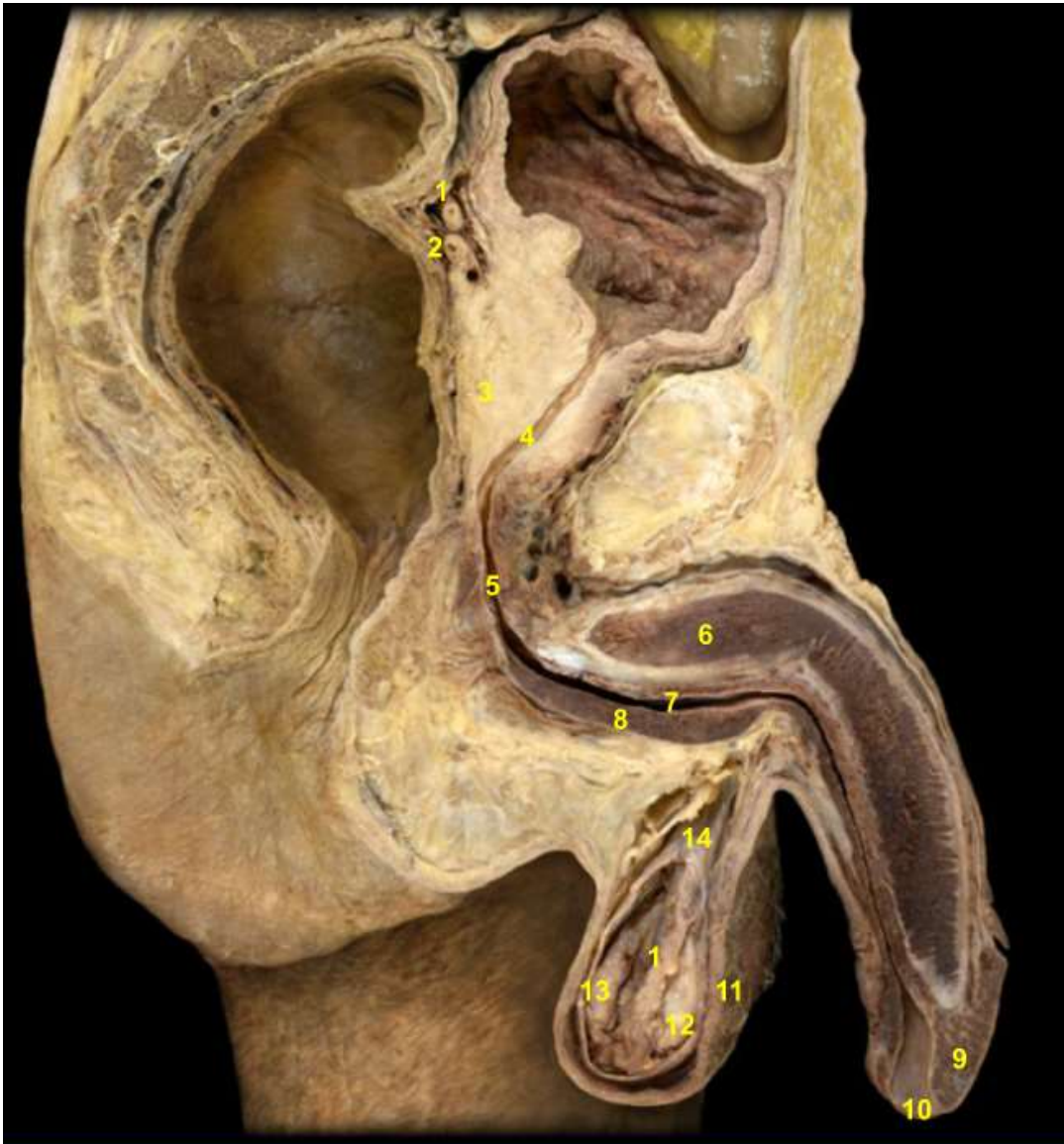
In the sectioned scrotum, we can see the fibrous outer layer of the testis - the tunica albuginea (7) - as well as the lobules of seminiferous tubules within the testis (8). Just posterior to the testis, we can see the coiled tubes of the epididymis (9).

We can also see urinary structures including the: detrusor muscle (10), rugae of urinary bladder (11), internal urethral sphincter (12), and internal urethral orifice (13).

Within the prostate gland (14), we can see the ejaculatory duct (15) and prostatic urethra (16). The prostate is supported by the urogenital diaphragm (17). Running through the diaphragm is the membranous urethra (18).

Name 1-14?



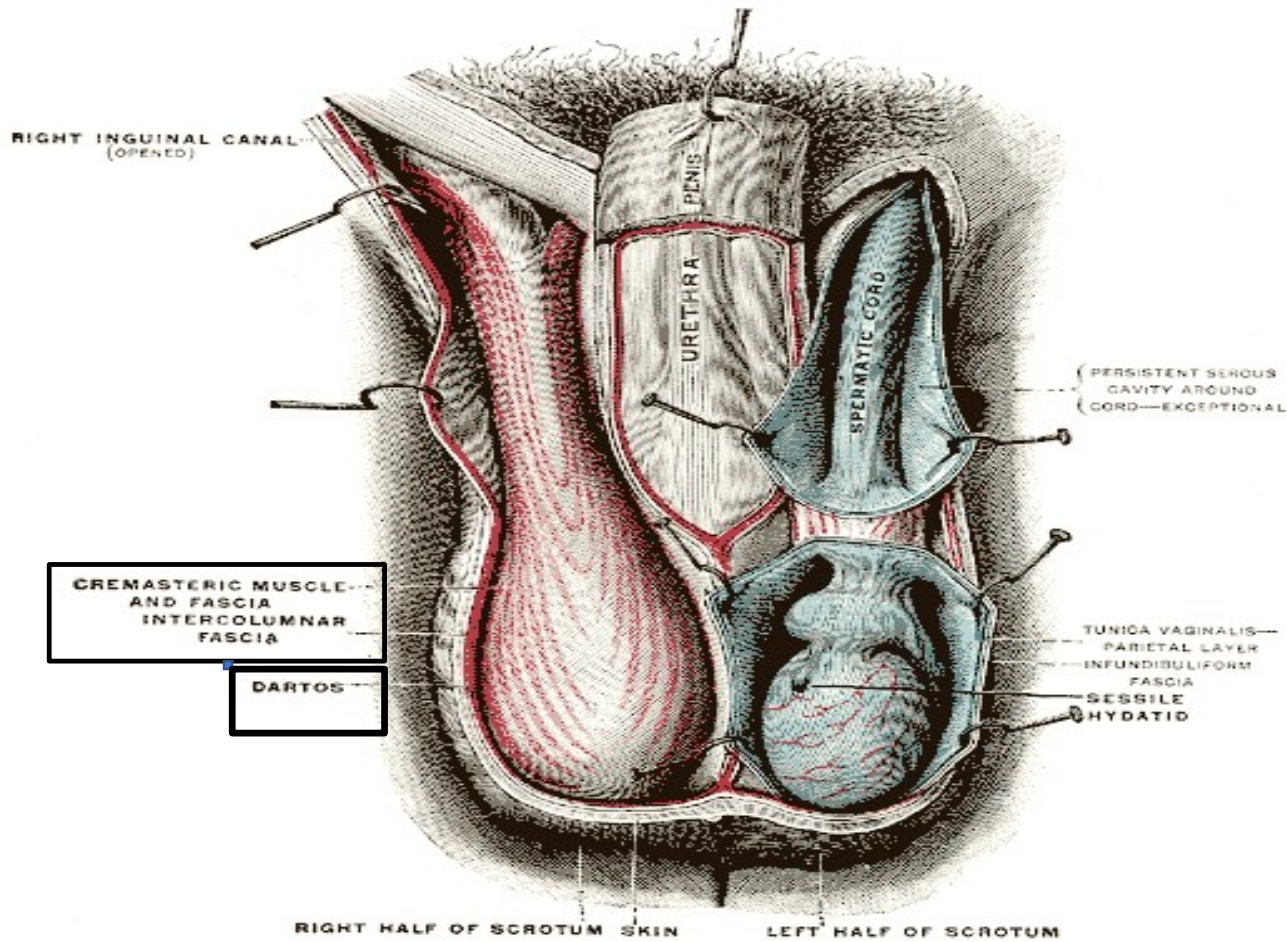


1. Vas deferens
2. Seminal vesicle
3. Prostate gland
4. Prostatic urethra
5. Membranous urethra
6. Corpus cavernosa
7. Penile urethra
8. Corpus spongiosum
9. Glans penis
10. External urethral orifice
11. Scrotum
12. Testis
13. Epididymis
14. Spermatic cord



Muscles of the scrotum?

- **Dartos** – smooth muscle that wrinkles scrotal skin
- **Cremaster** – bands of skeletal muscle that elevate the testes



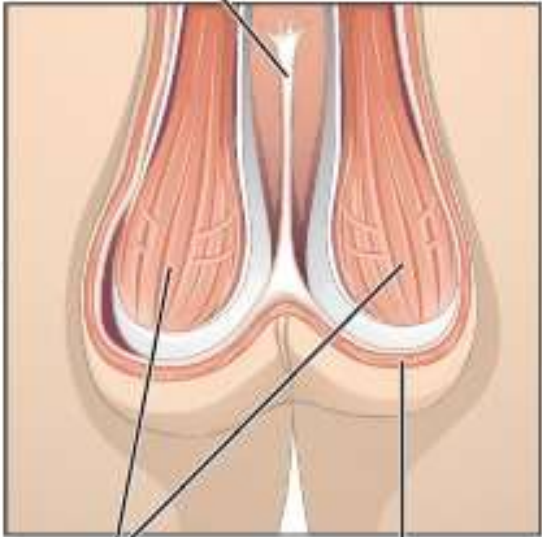
External view of scrotum



Raphe



Muscle layer



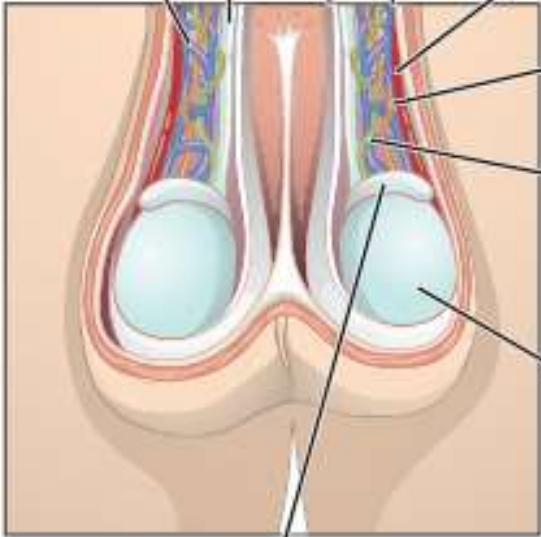
Scrotal septum

Cremaster muscles

Dartos muscles



Deep tissues



Plexus of testicular veins

Ductus deferens

Spermatic cord

Testicular artery

Autonomic nerve

Lymphatic vessel

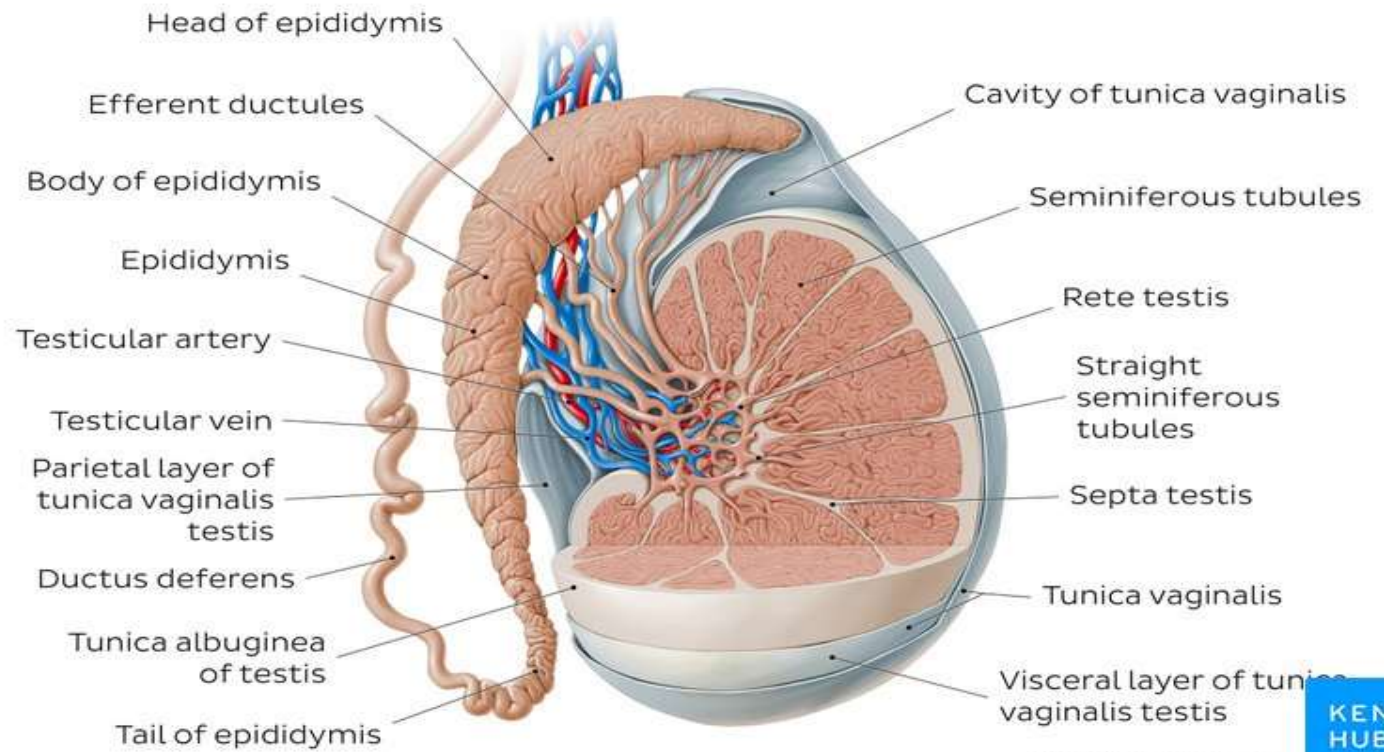
Testis

Epididymis



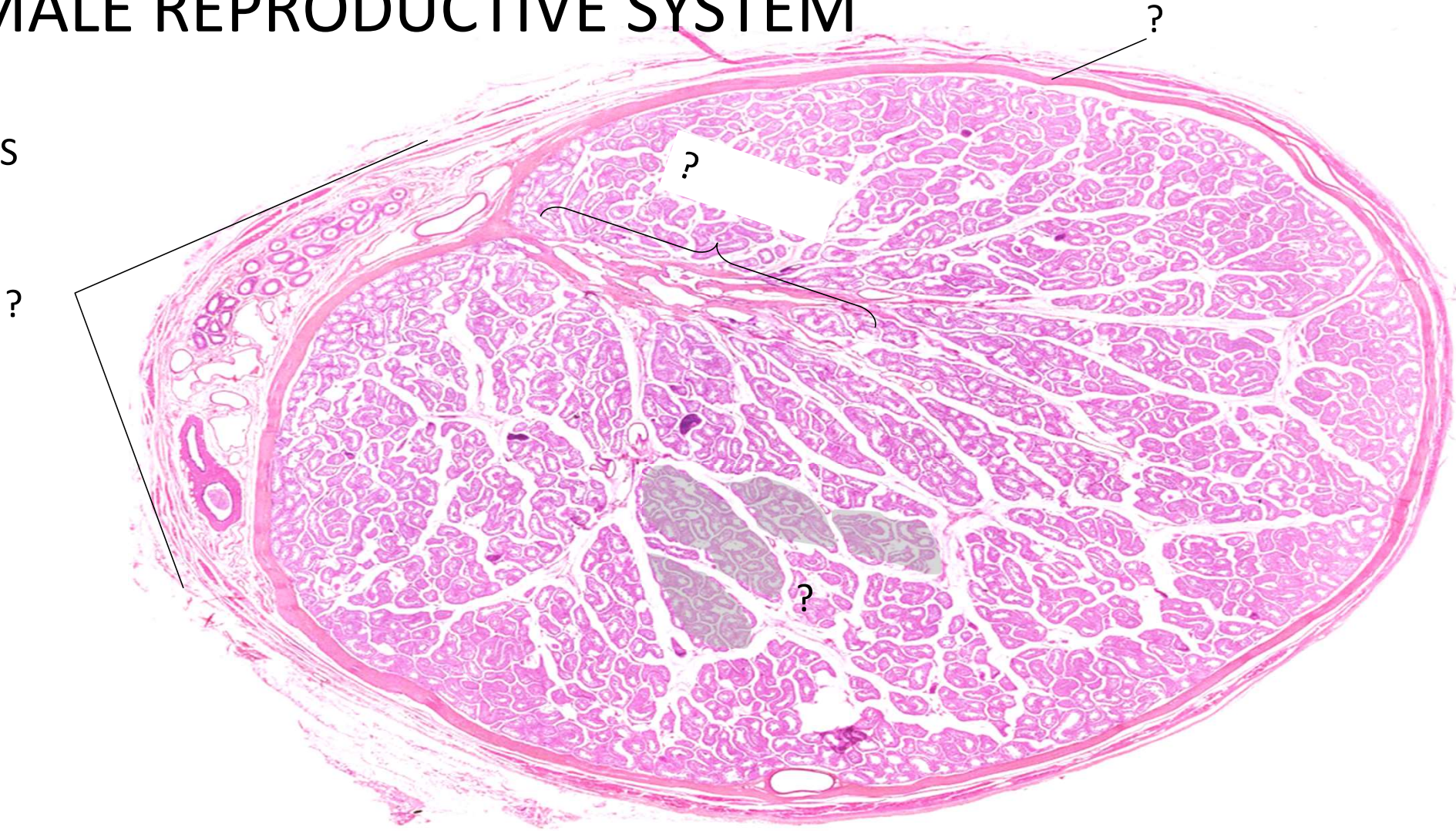


1. Testis
2. Epididymis
3. Vas deferens
4. Testicular vein intertwining with the testicular artery

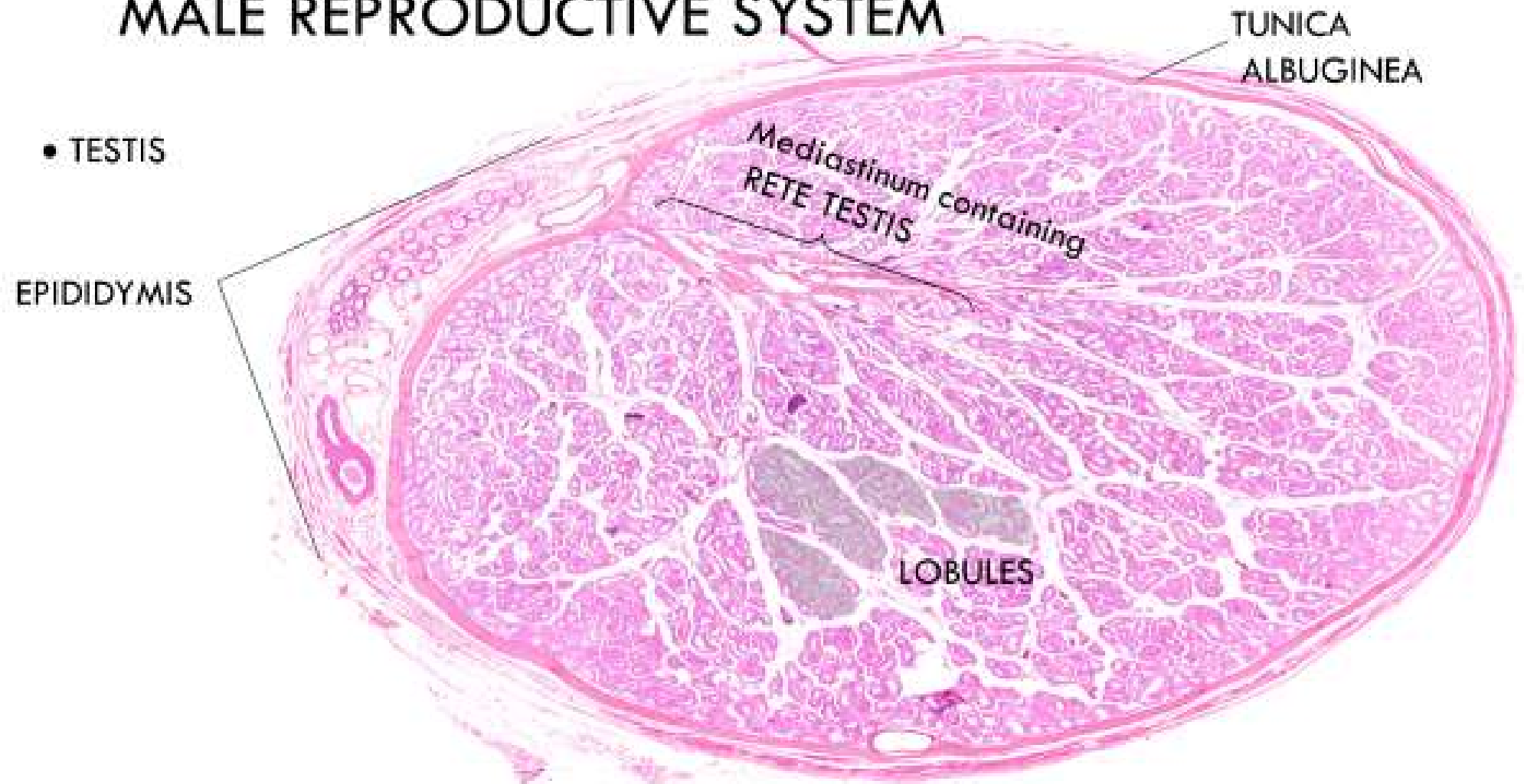


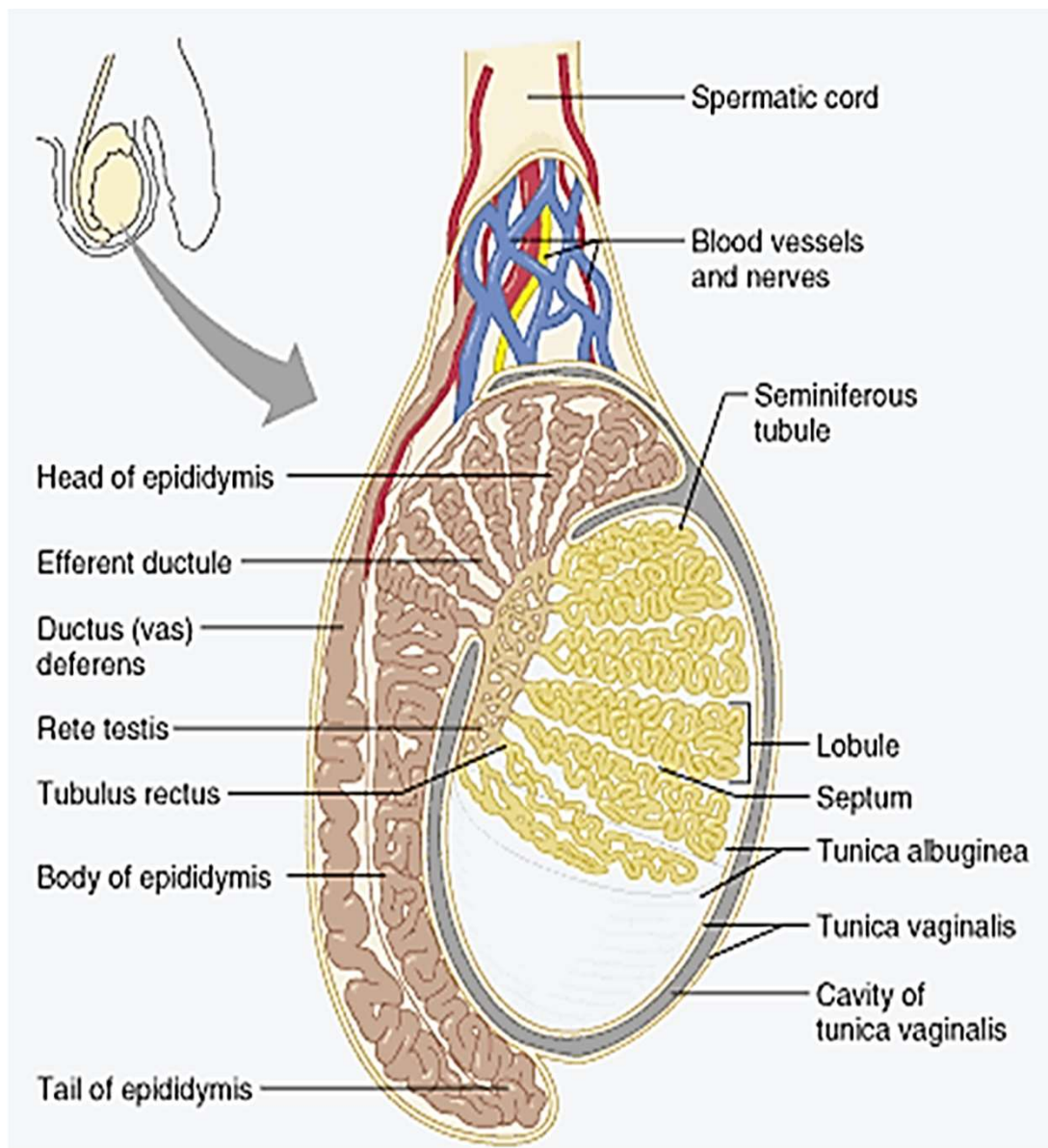
MALE REPRODUCTIVE SYSTEM

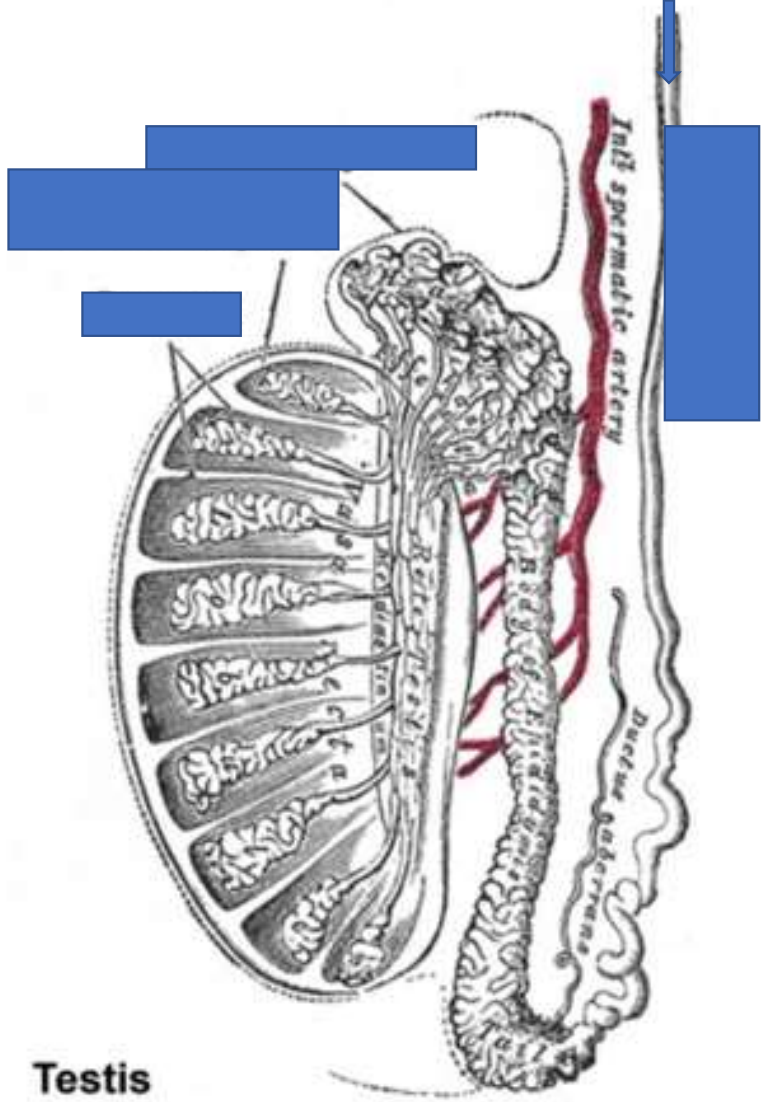
• TESTIS



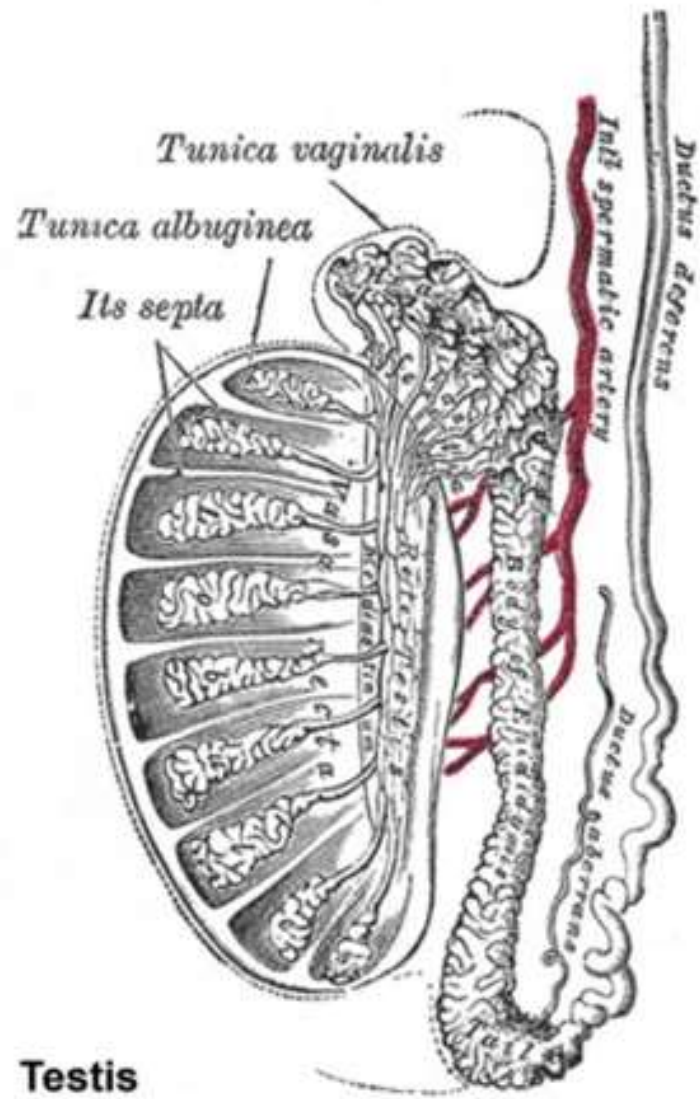
MALE REPRODUCTIVE SYSTEM

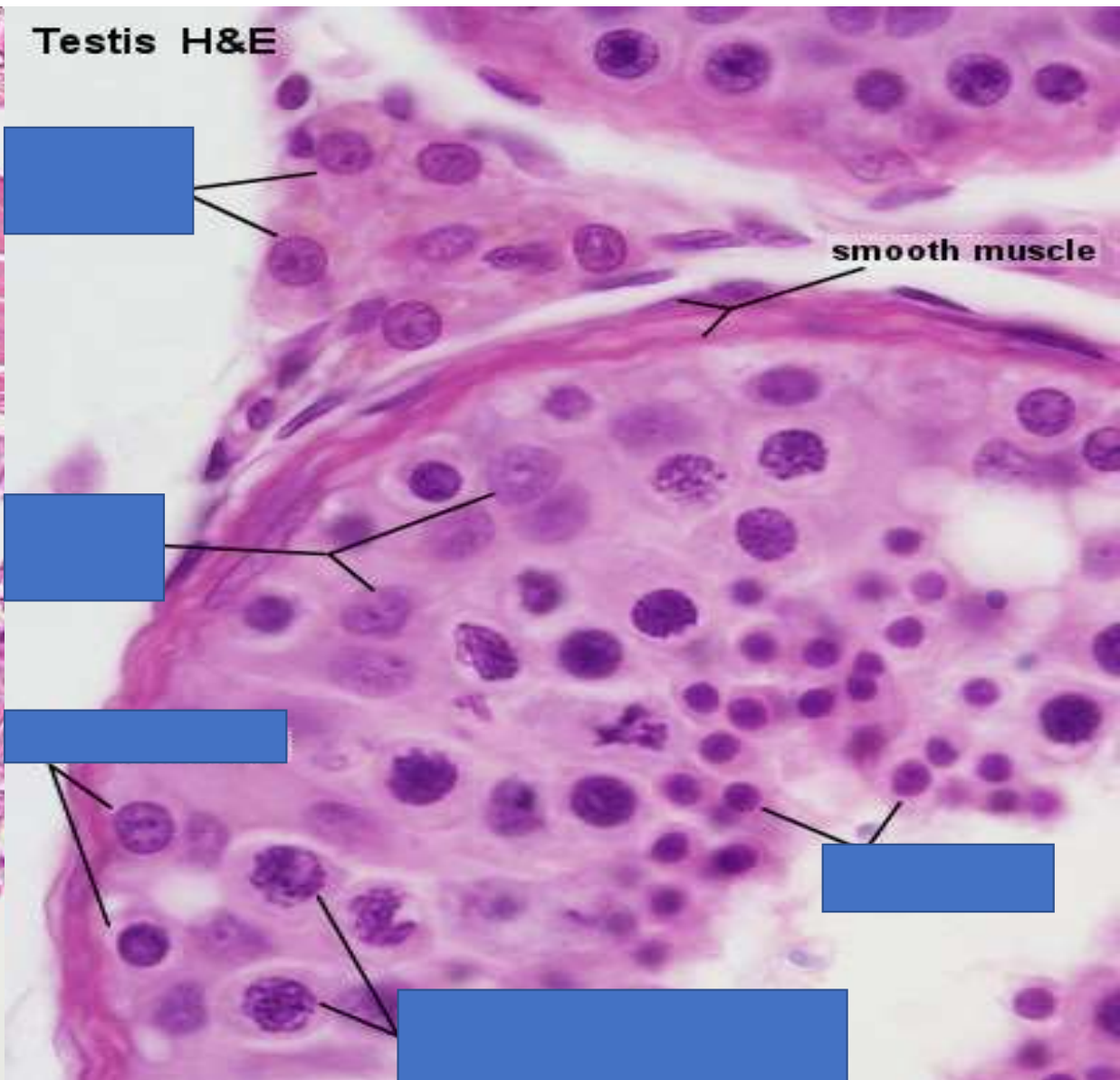
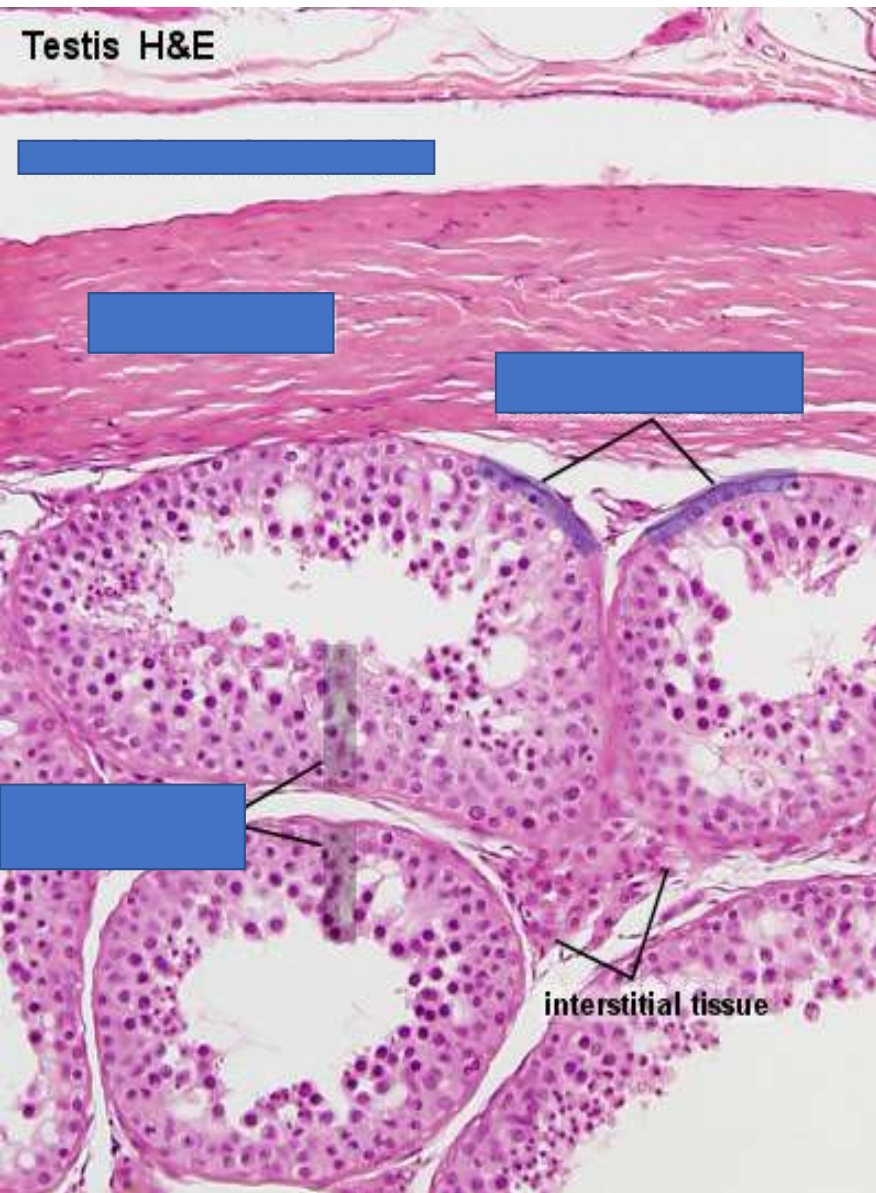


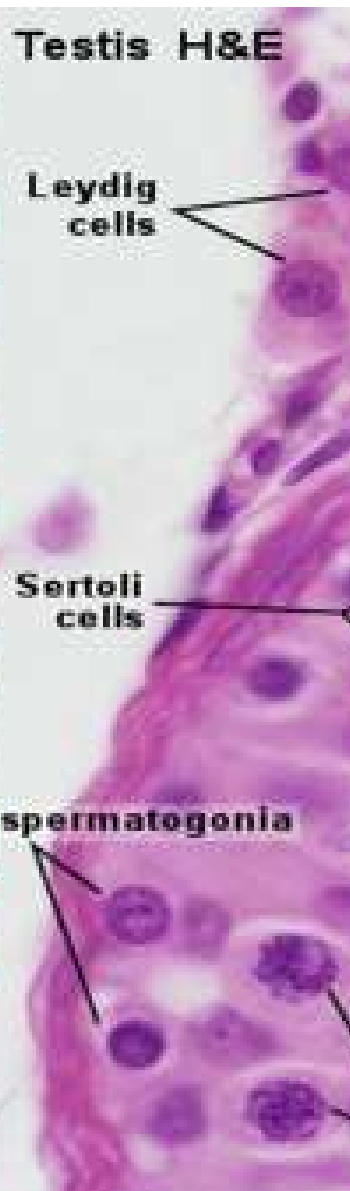
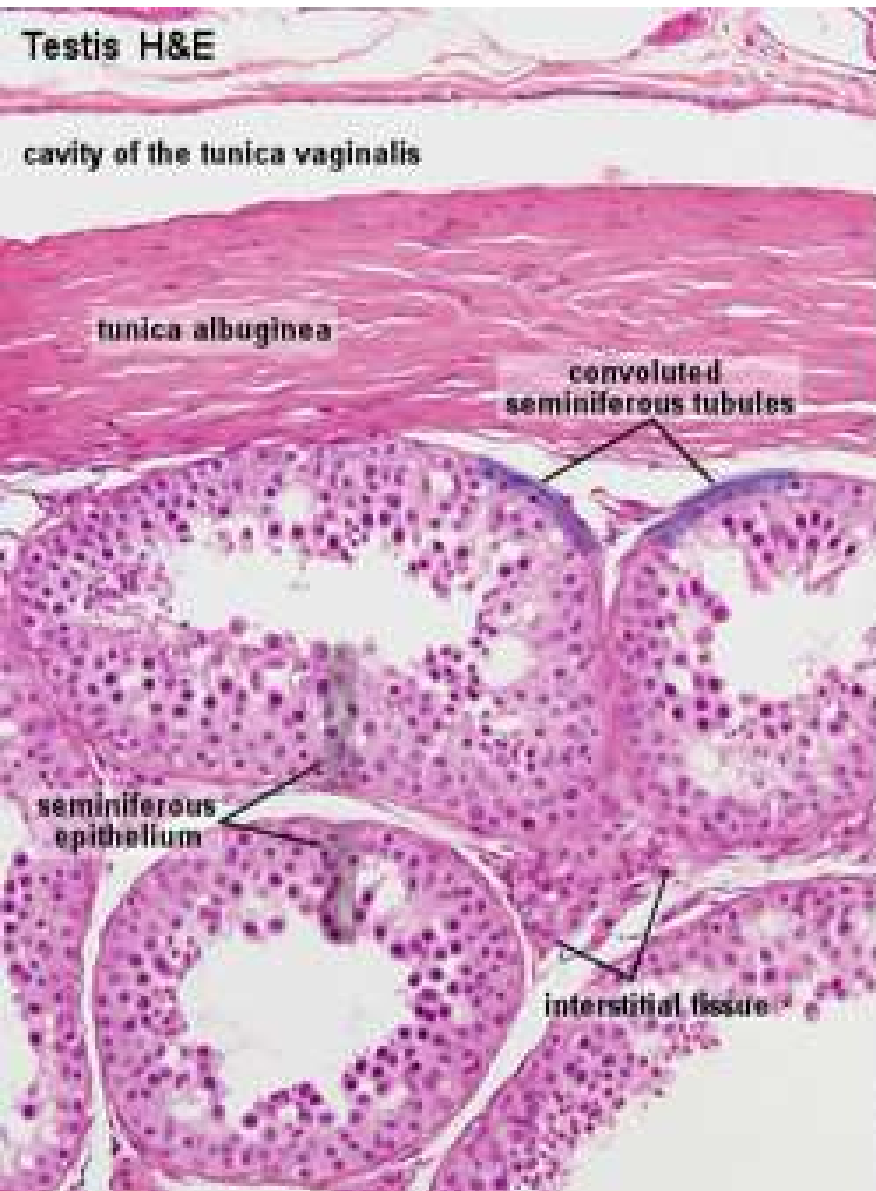




Testis





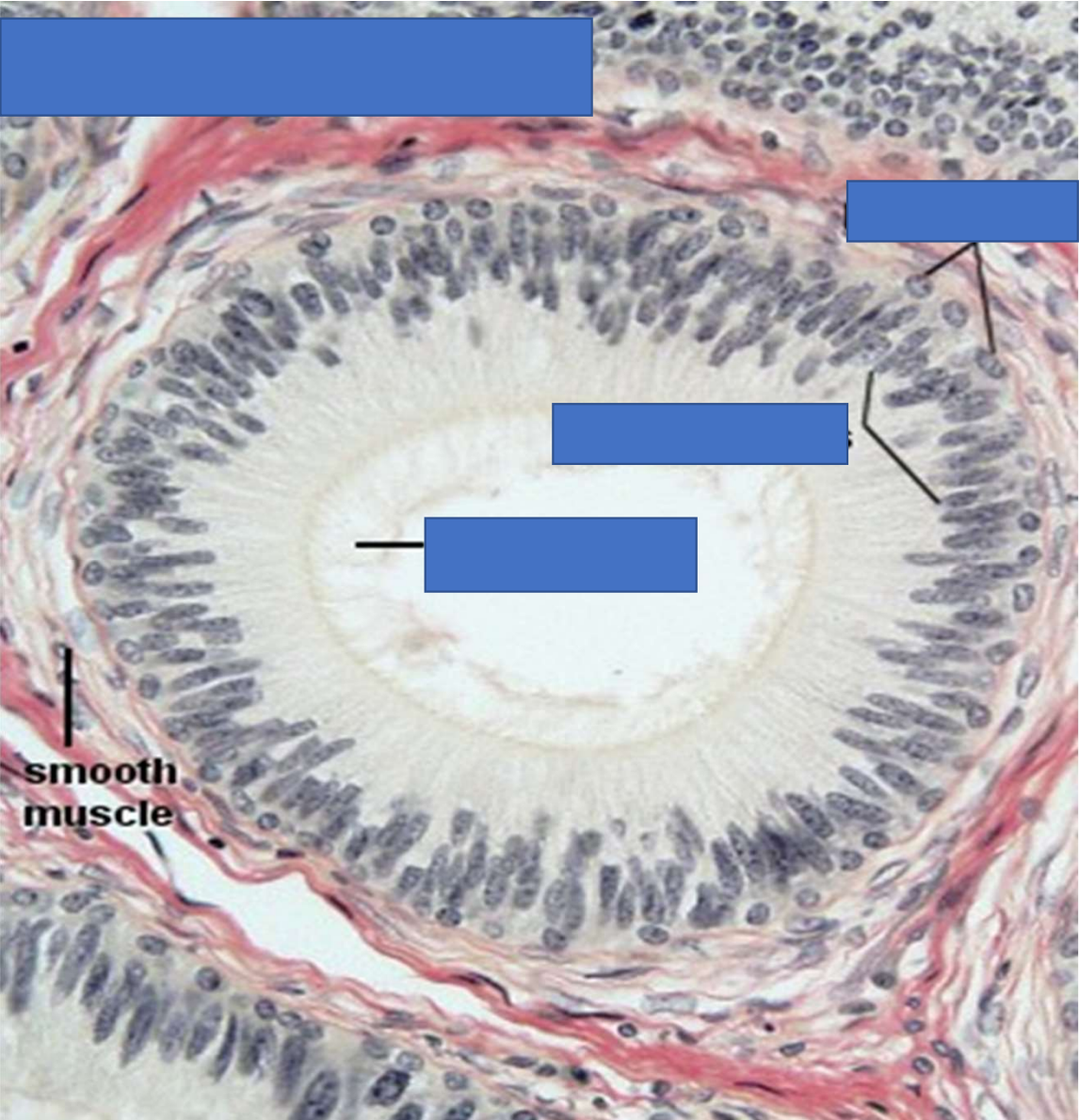


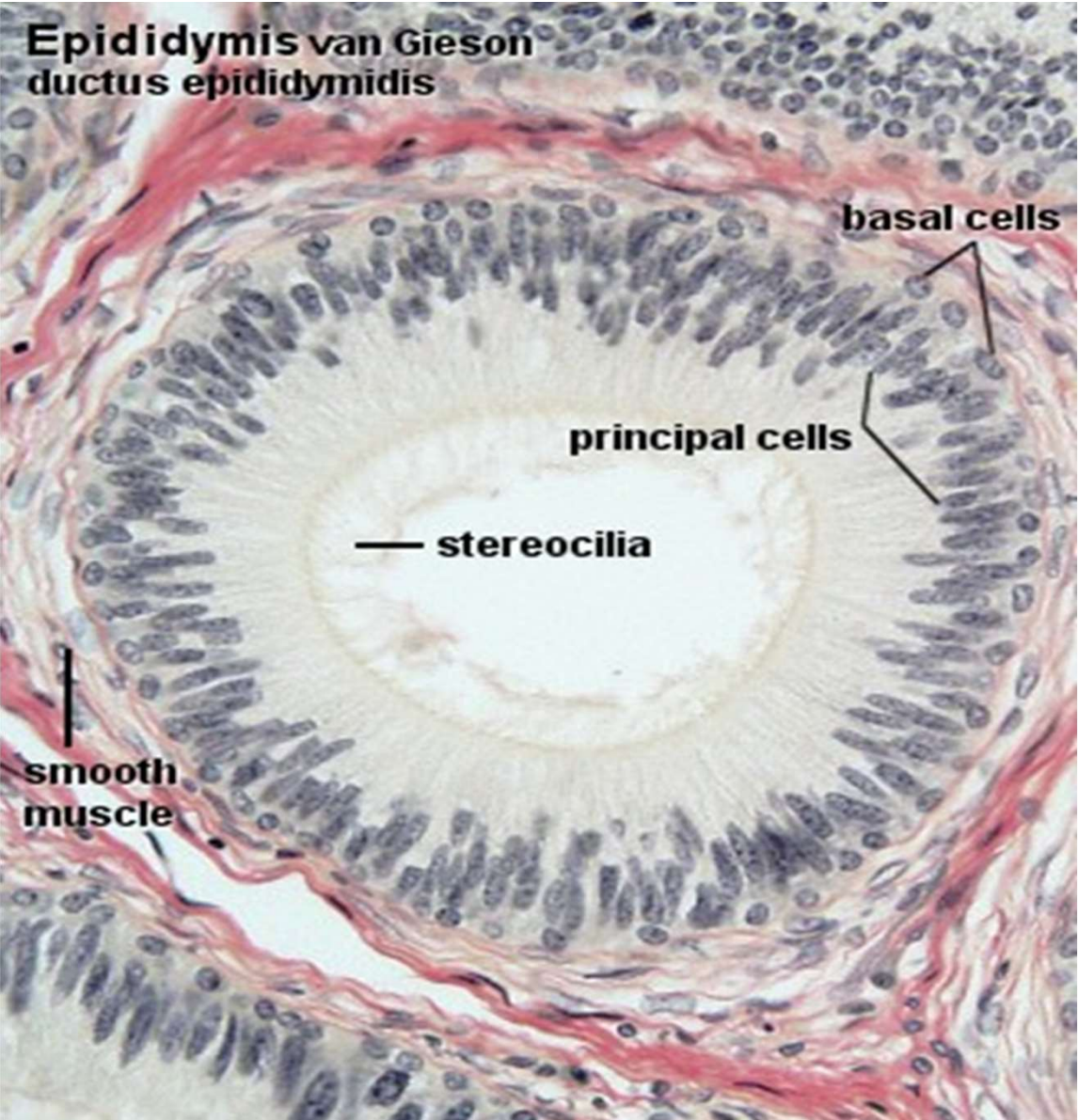
Interstitial or Leydig cells are located in the connective tissue surrounding the seminiferous tubules. They produce testosterone, the male sex hormone responsible for the growth and maintenance of the cells of the germinal epithelium and the development of secondary sex characteristics.

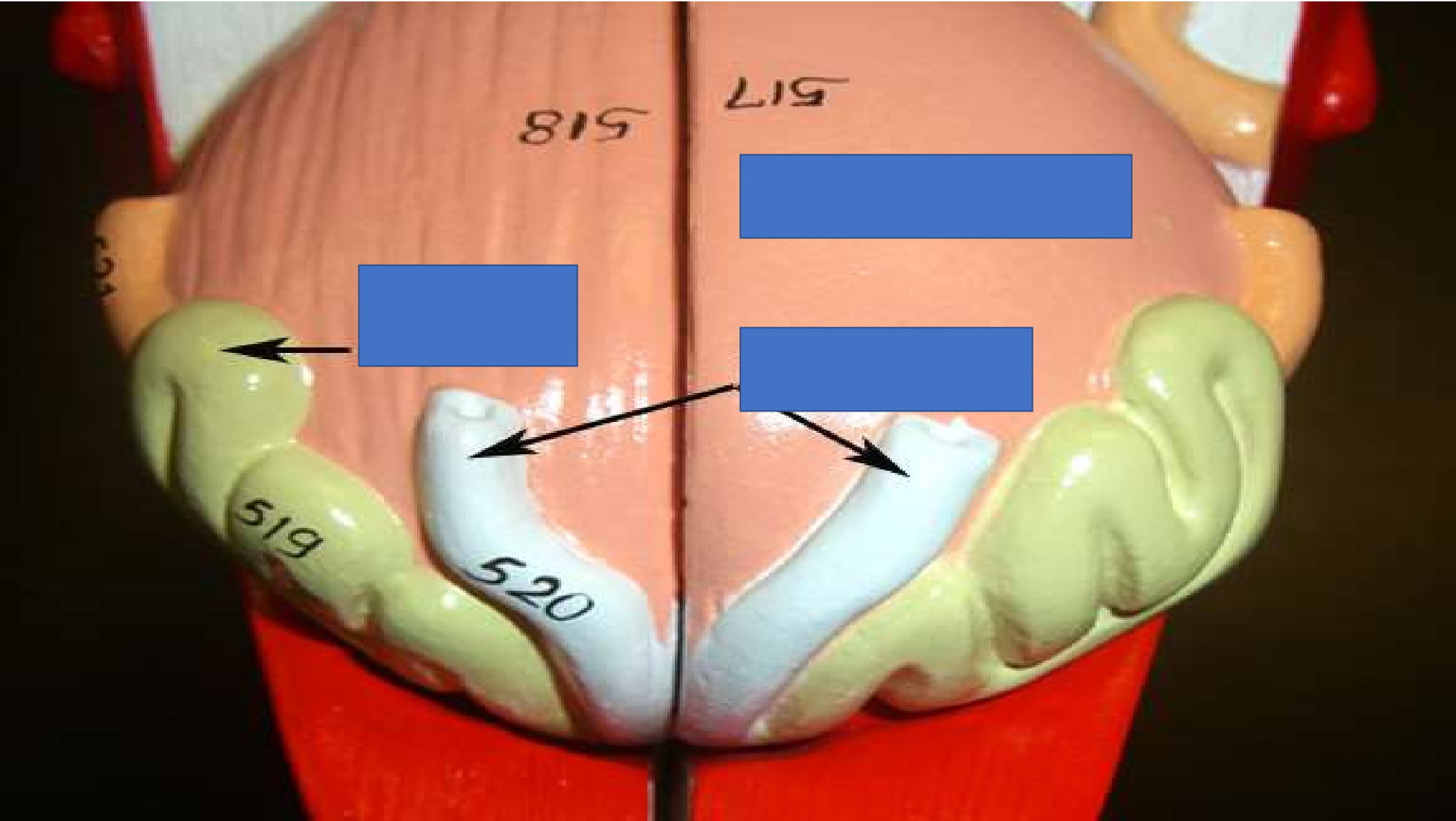
Sertoli cells facilitate the progression of germ cells to spermatozoa via direct contact and by controlling the environment milieu within the seminiferous tubules. The regulation of spermatogenesis by FSH and testosterone occurs by the action of these hormones on the Sertoli cells.

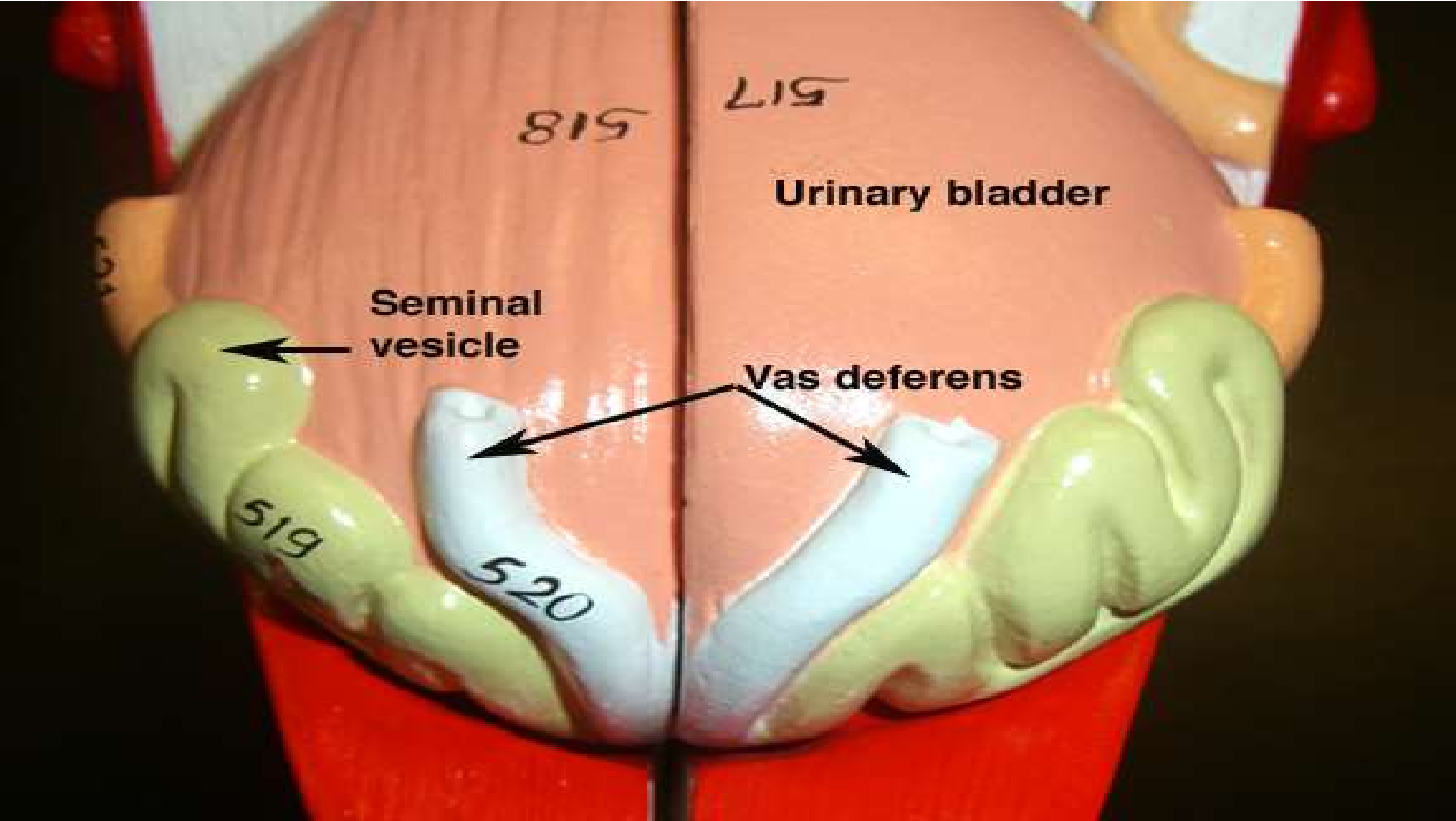
spermatids

primary spermatocytes









518

517

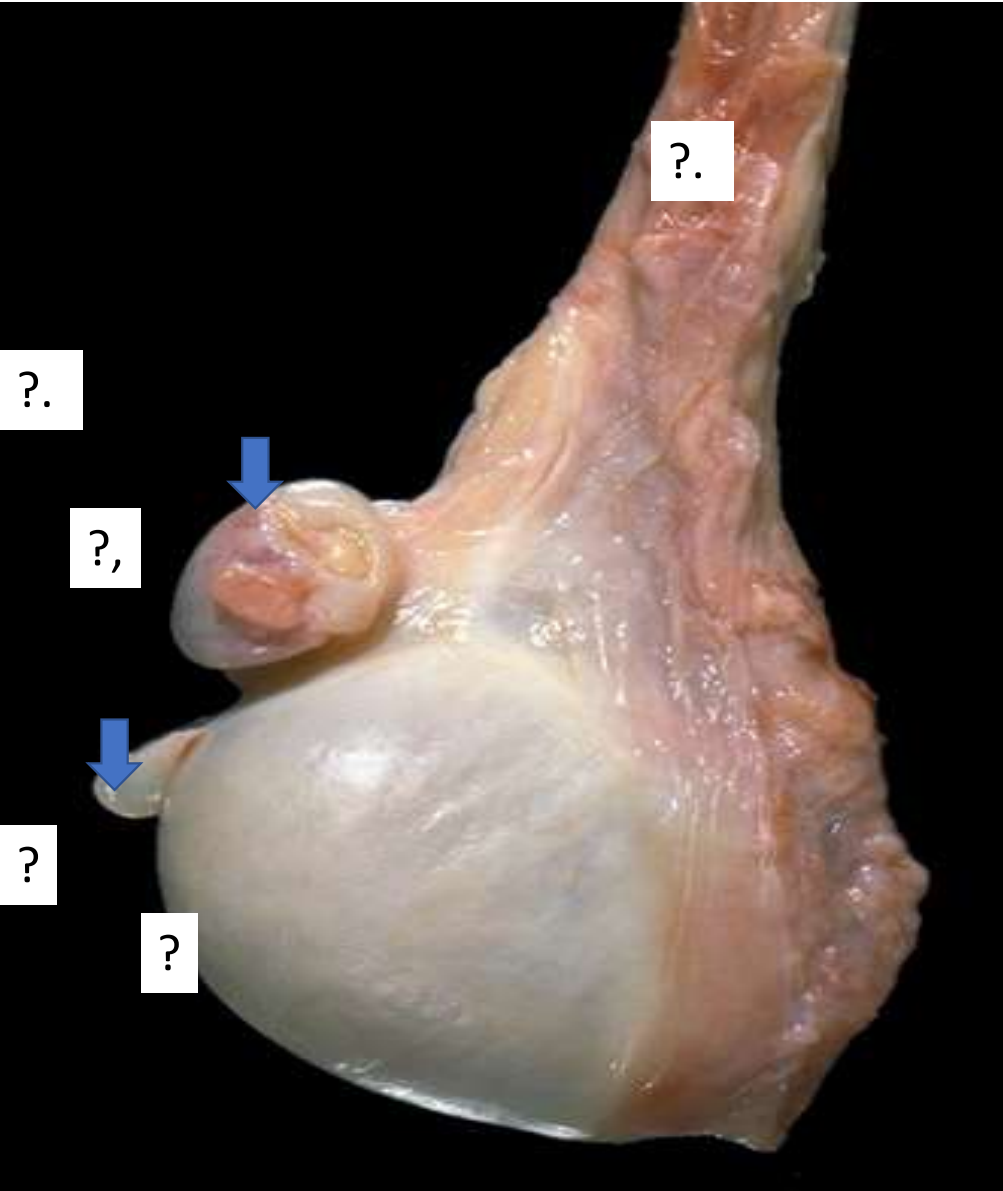
Urinary bladder

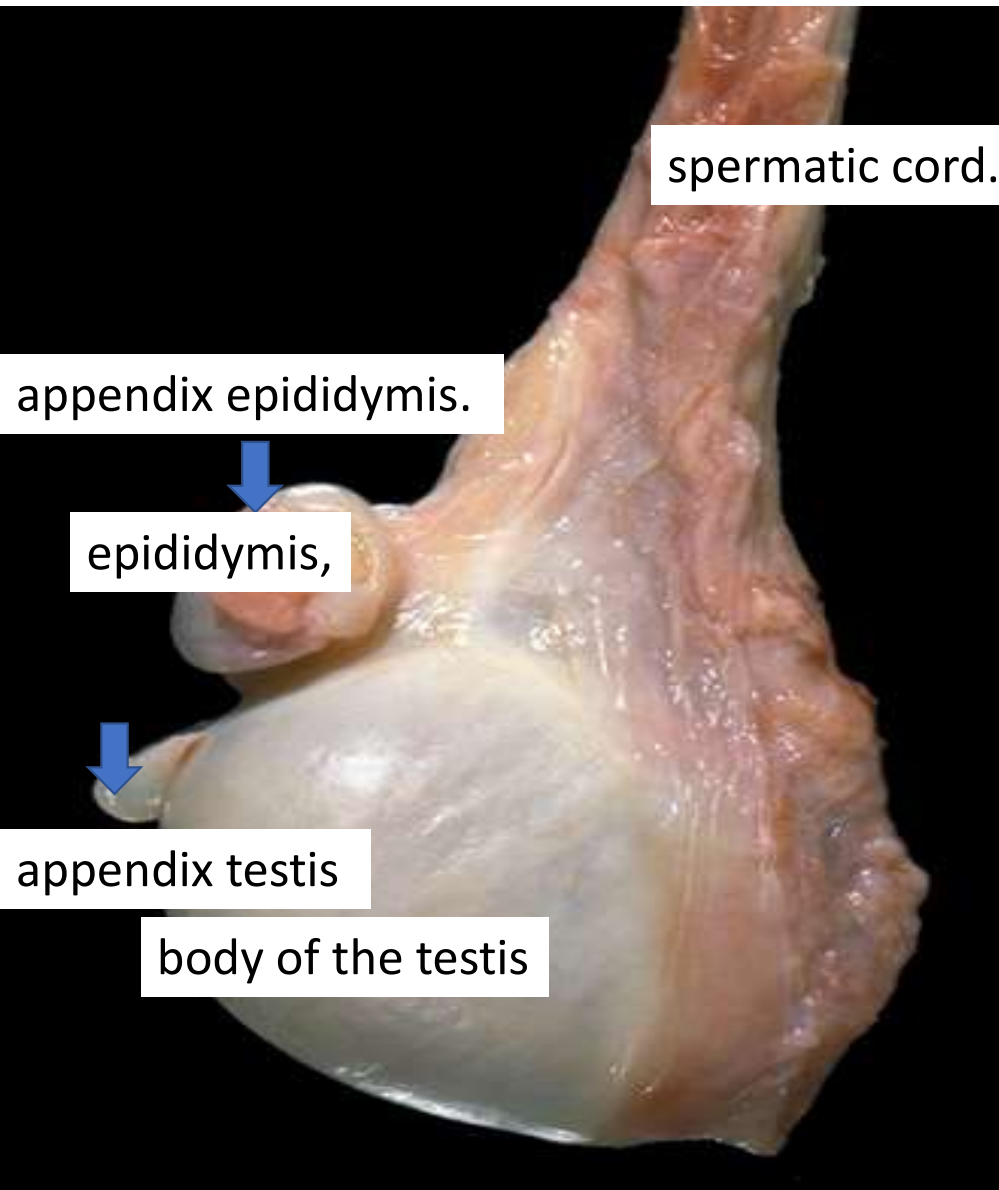
Seminal vesicle

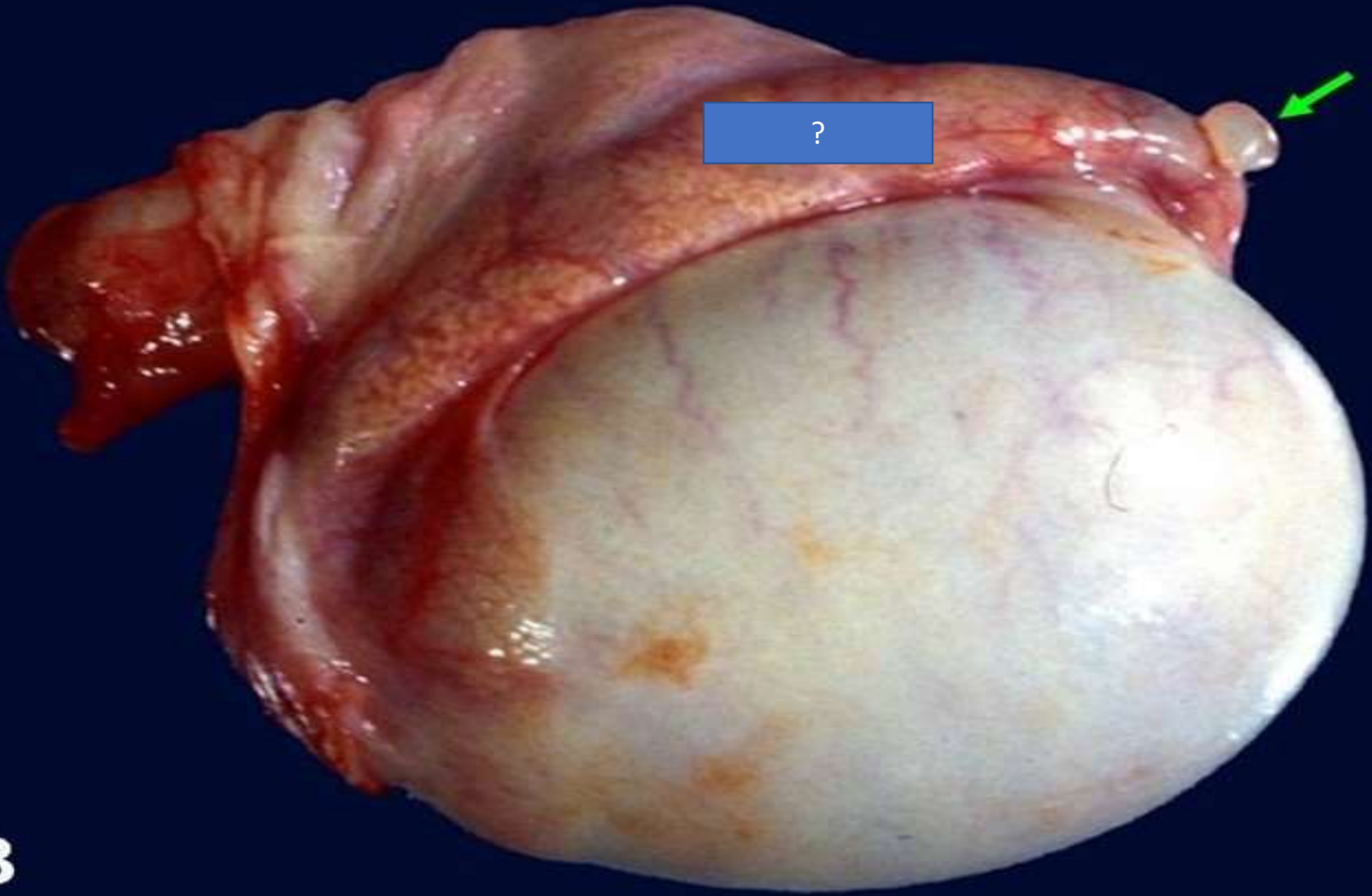
Vas deferens

519

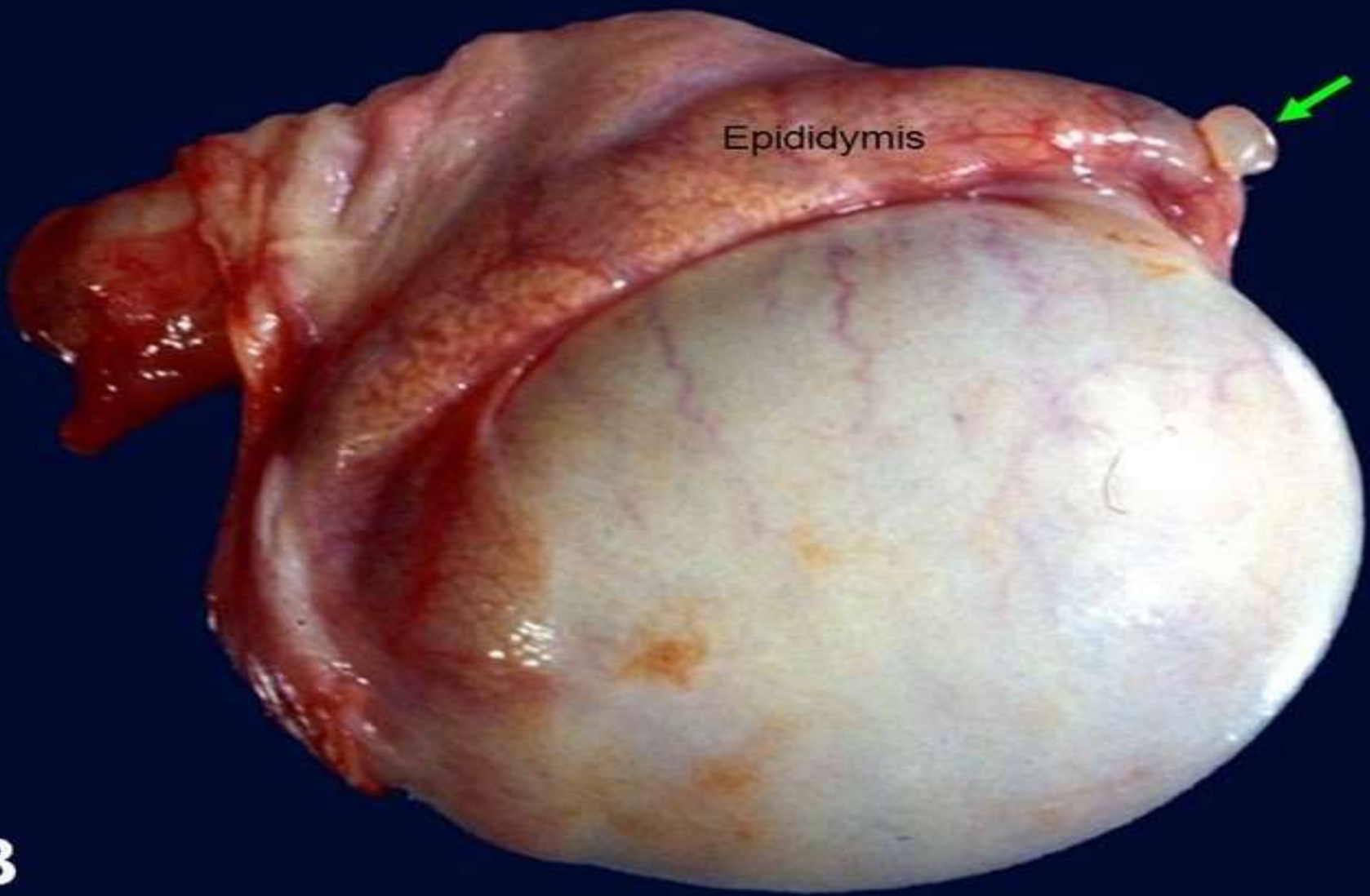
520





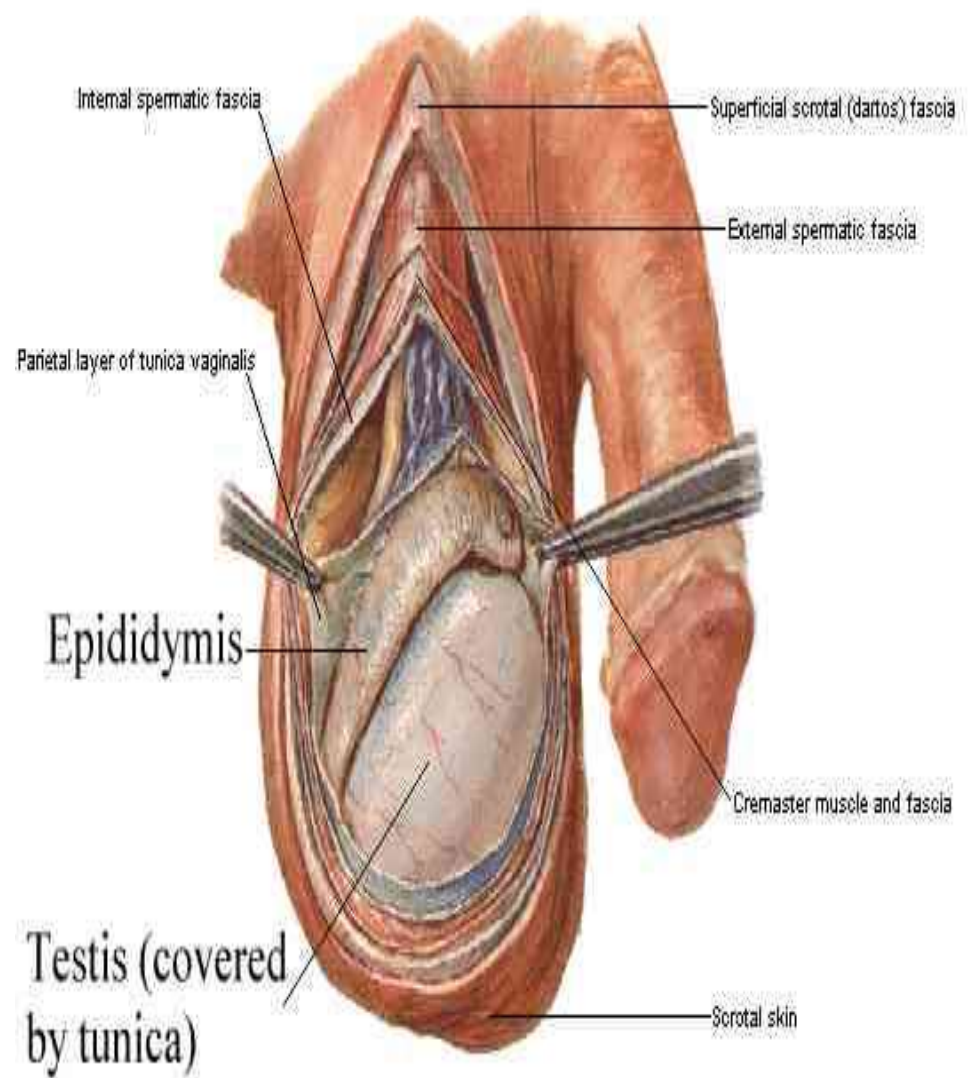
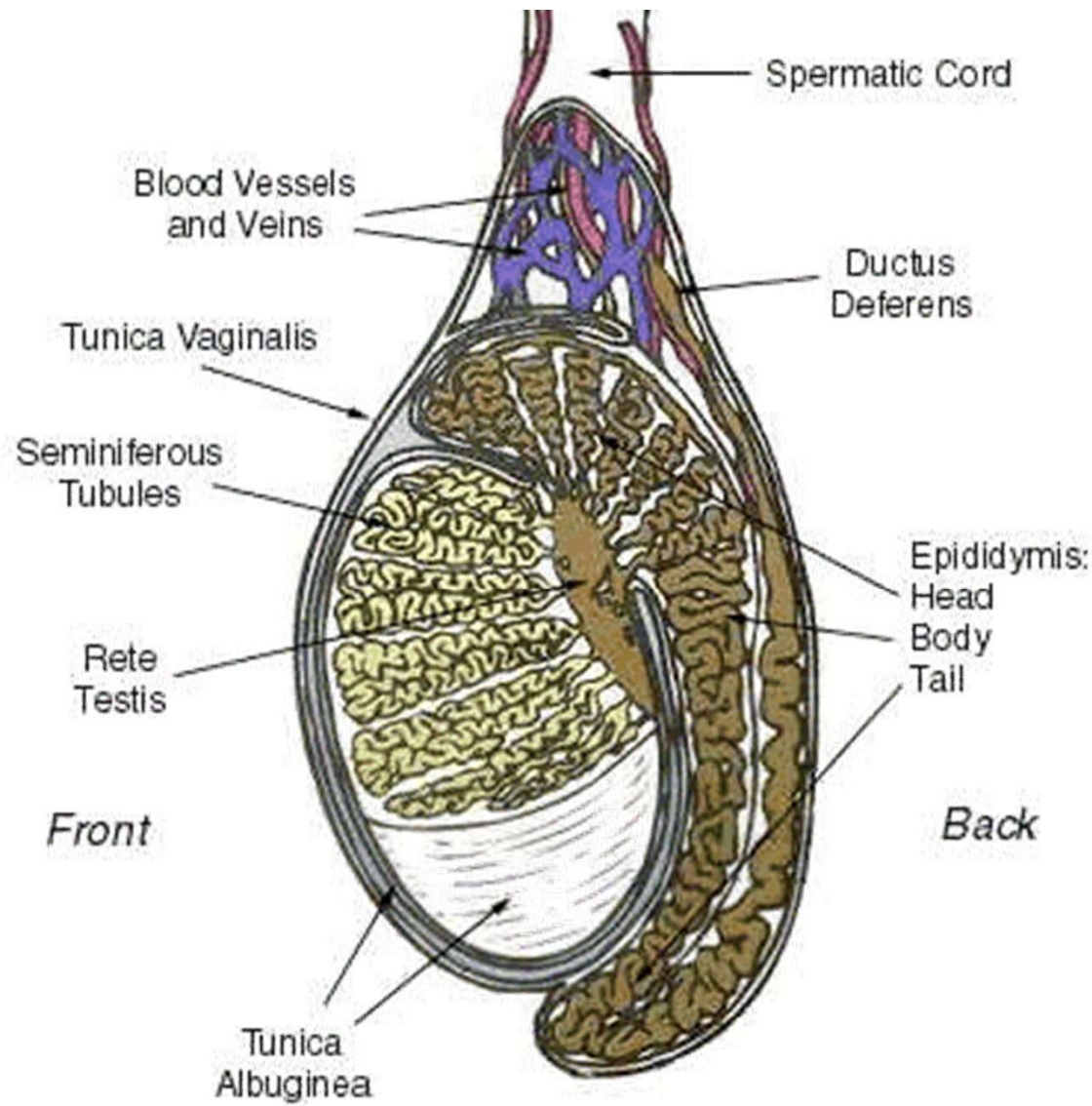


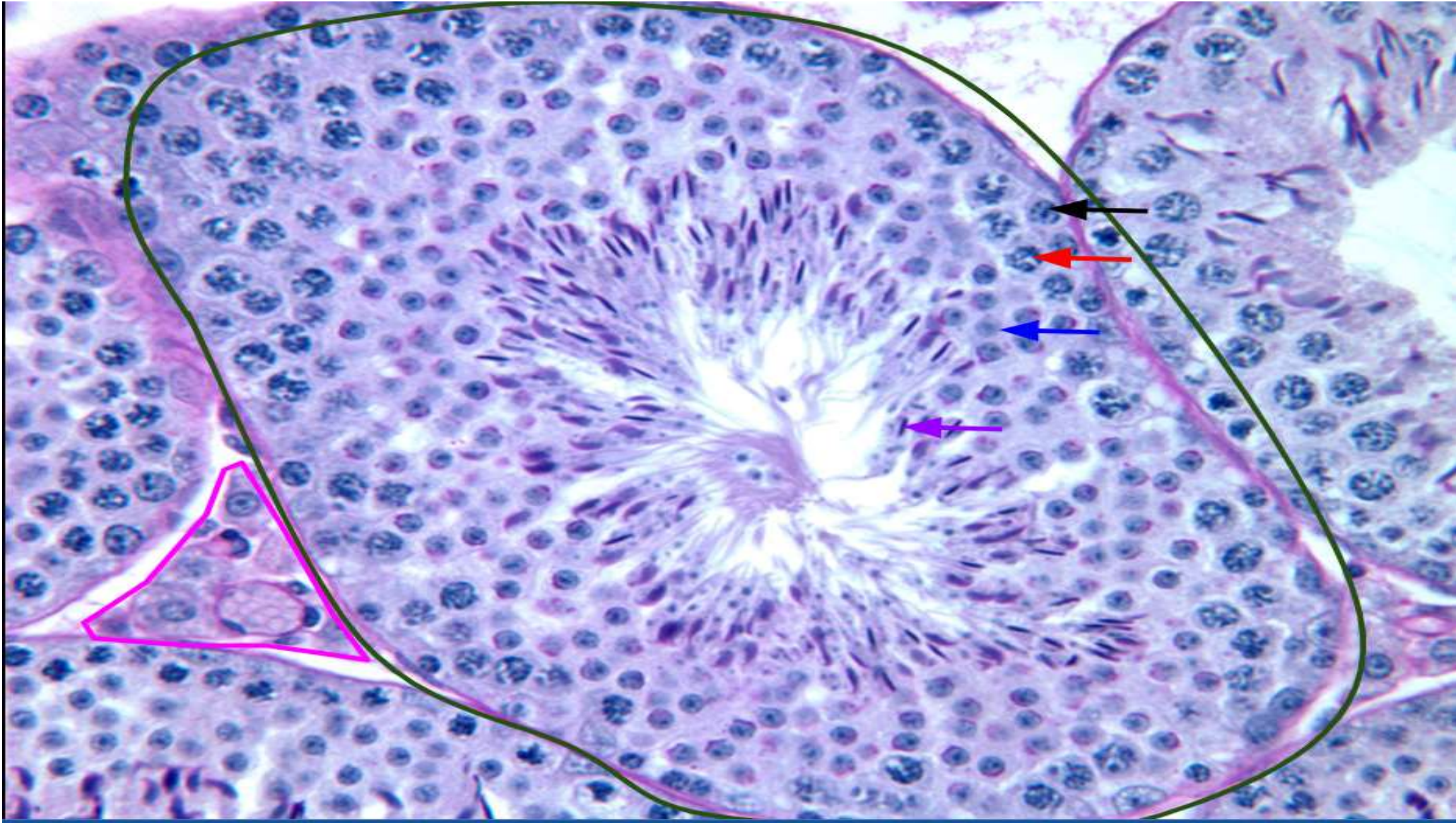
B

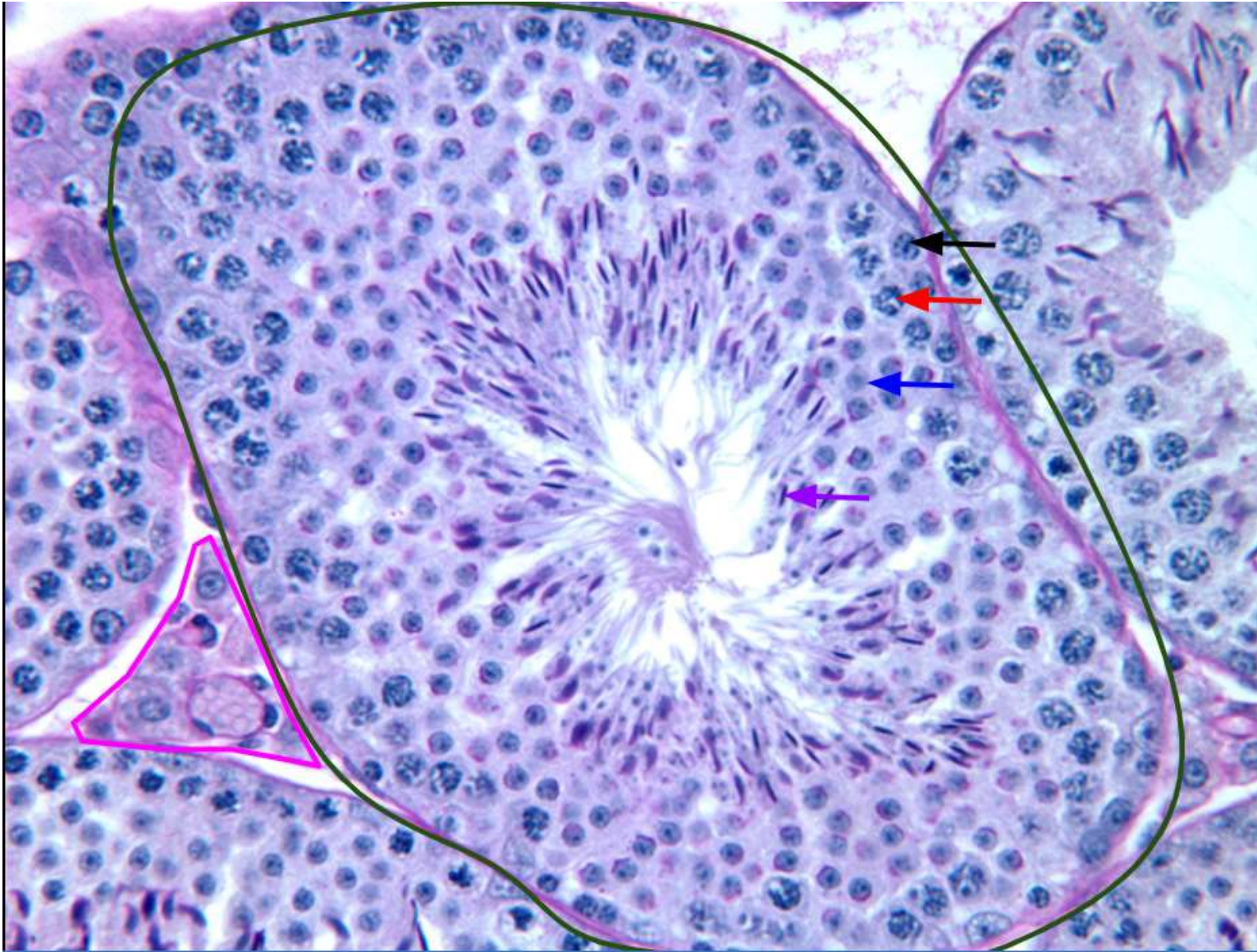


Epididymis

B







Seminiferous tubule

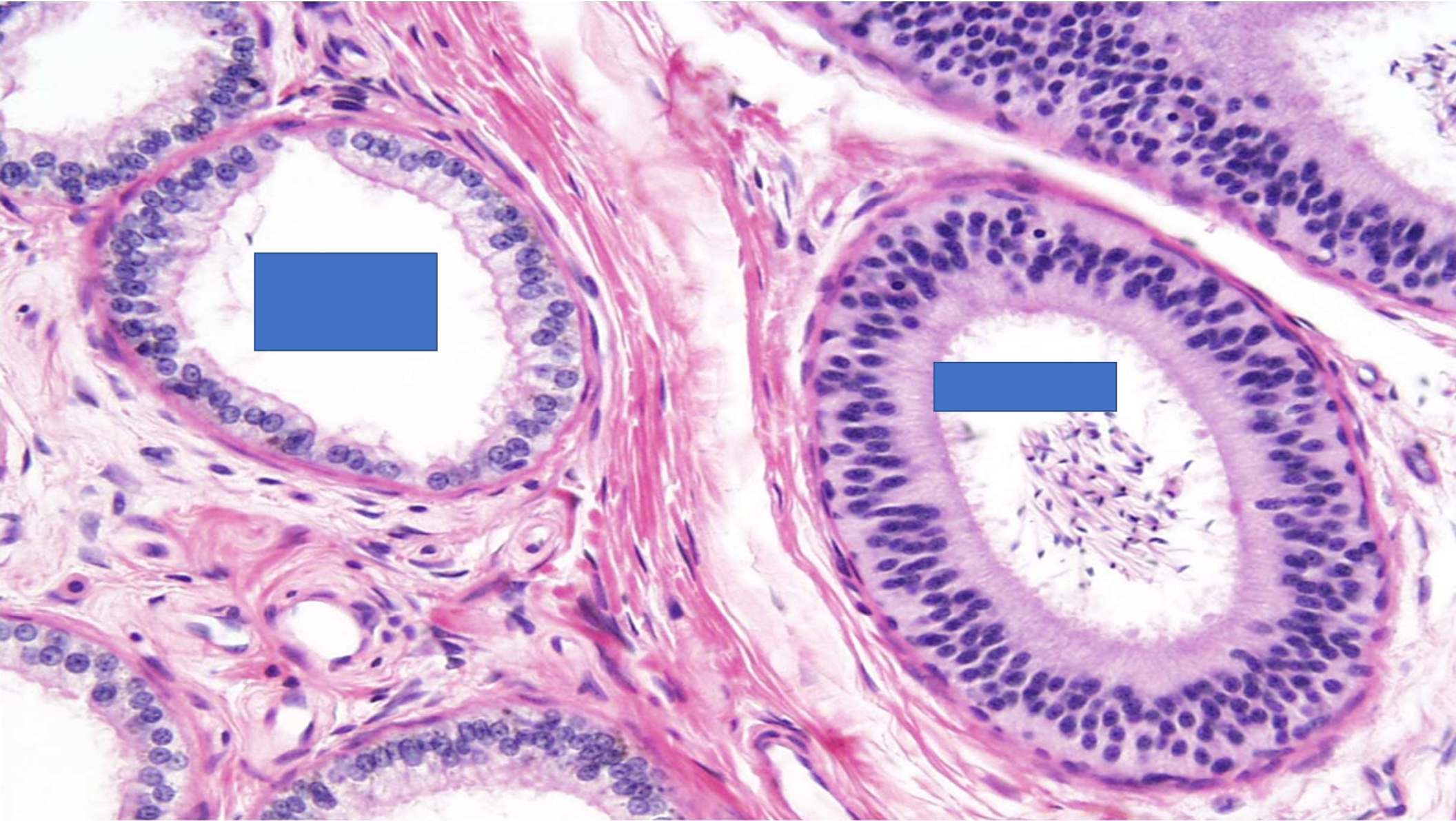
Spermatogonium

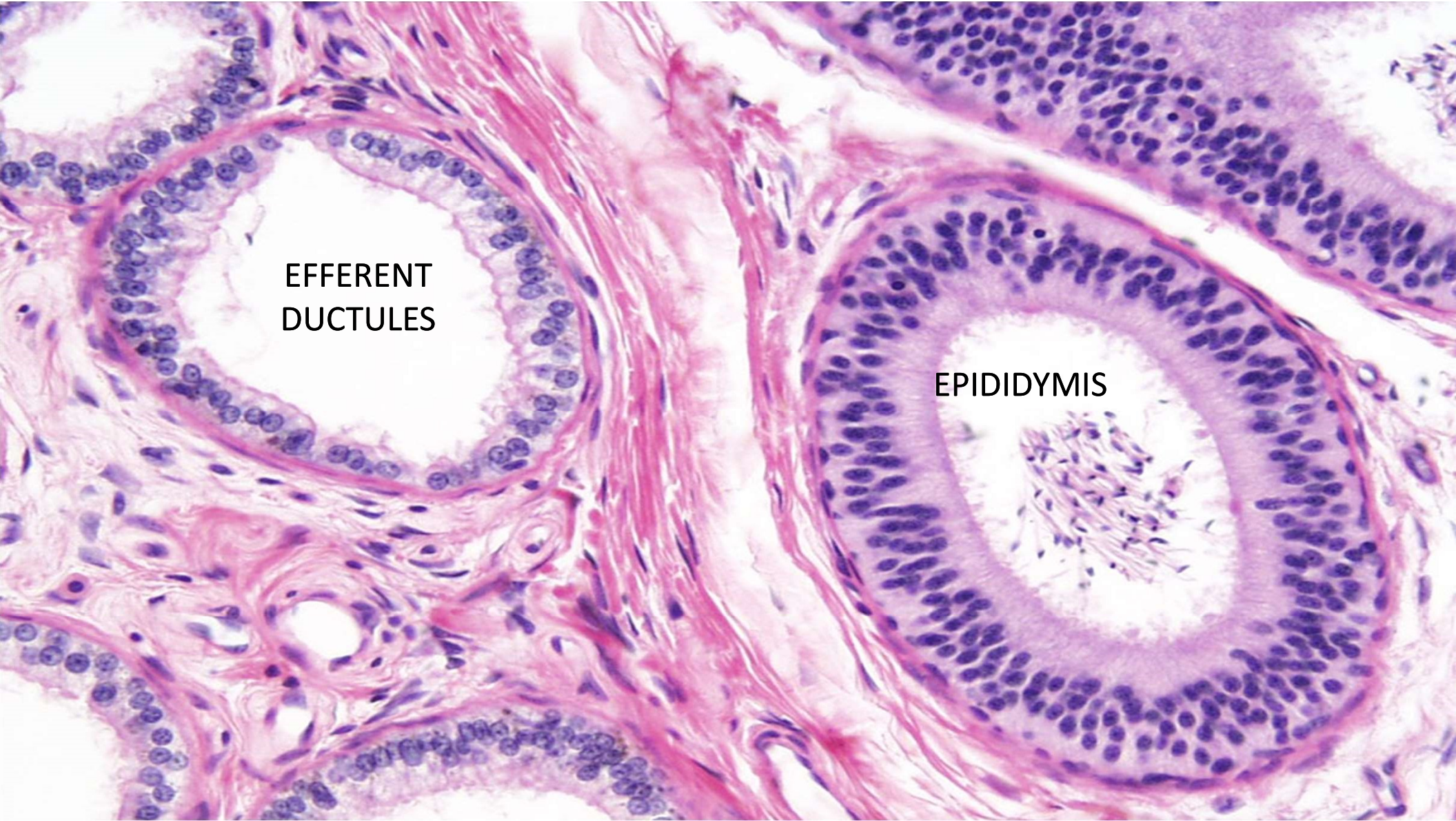
Primary spermatocyte

Spermatid

Spermatozoon

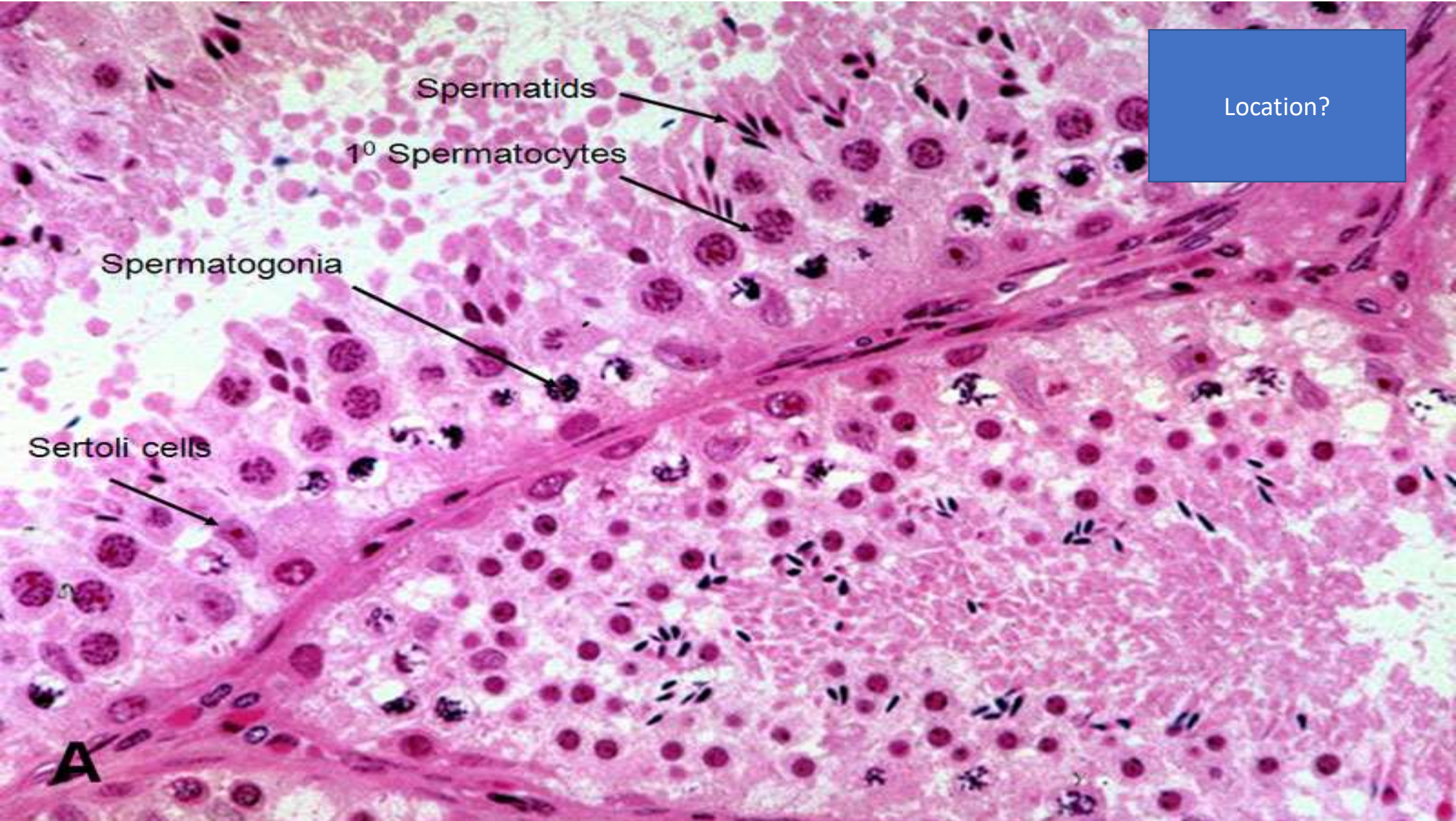
Interstitial cells





EFFERENT
DUCTULES

EPIDIDYMIS



Spermatids

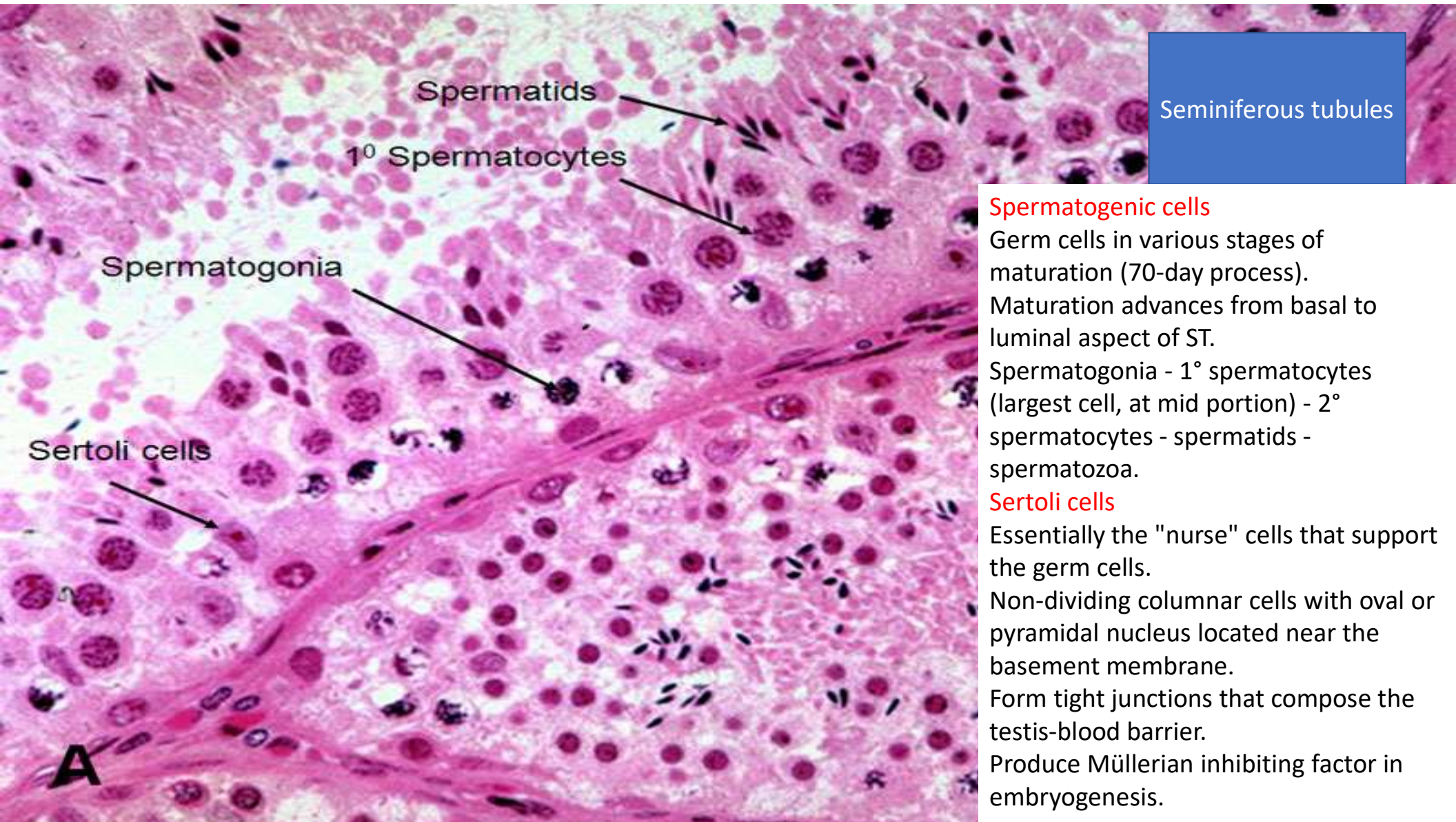
1° Spermatocytes

Spermatogonia

Sertoli cells

Location?

A



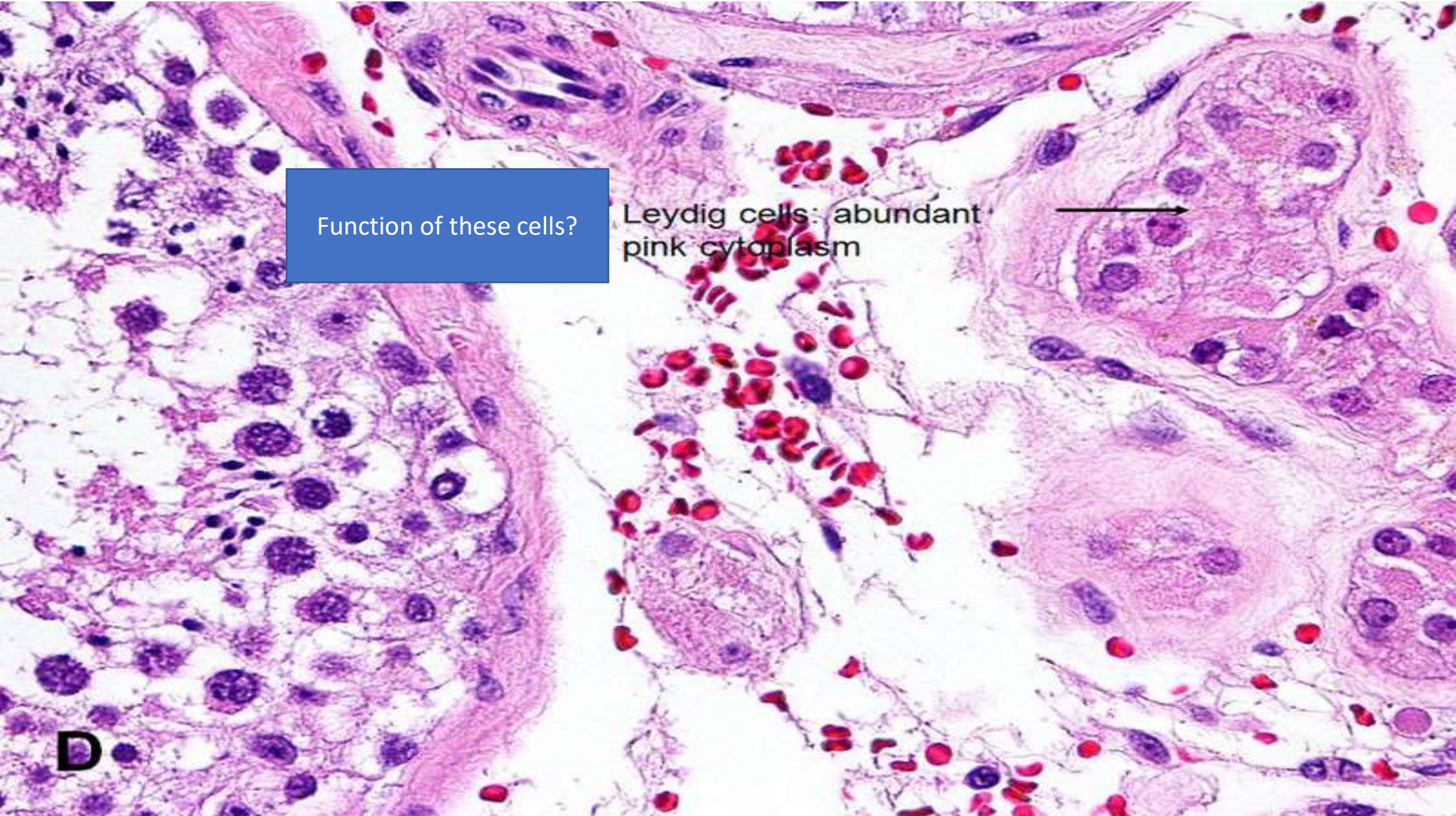
Seminiferous tubules

Spermatogenic cells

Germ cells in various stages of maturation (70-day process). Maturation advances from basal to luminal aspect of ST. Spermatogonia - 1° spermatocytes (largest cell, at mid portion) - 2° spermatocytes - spermatids - spermatozoa.

Sertoli cells

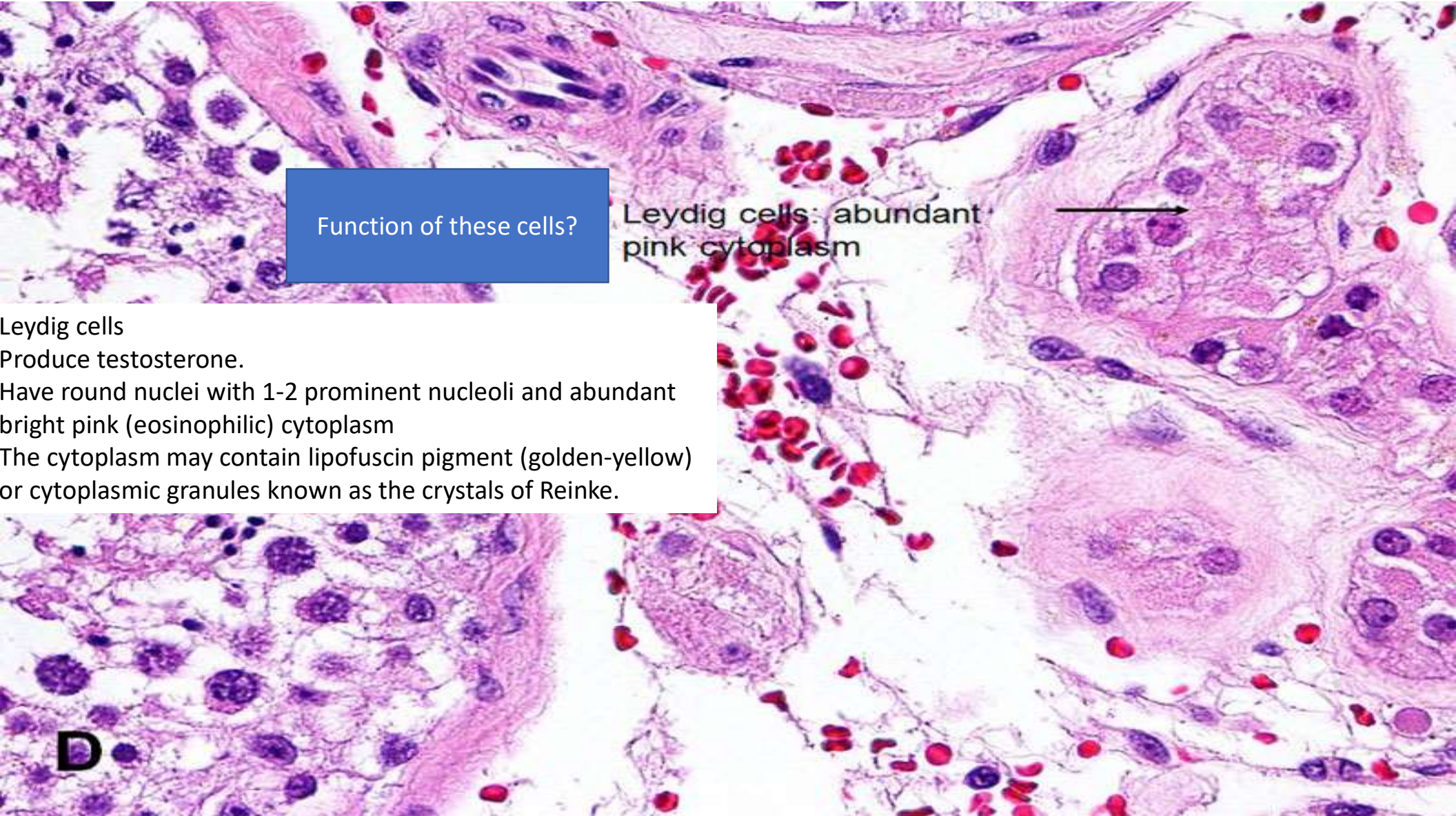
Essentially the "nurse" cells that support the germ cells. Non-dividing columnar cells with oval or pyramidal nucleus located near the basement membrane. Form tight junctions that compose the testis-blood barrier. Produce Müllerian inhibiting factor in embryogenesis.



Function of these cells?

Leydig cells: abundant pink cytoplasm

D

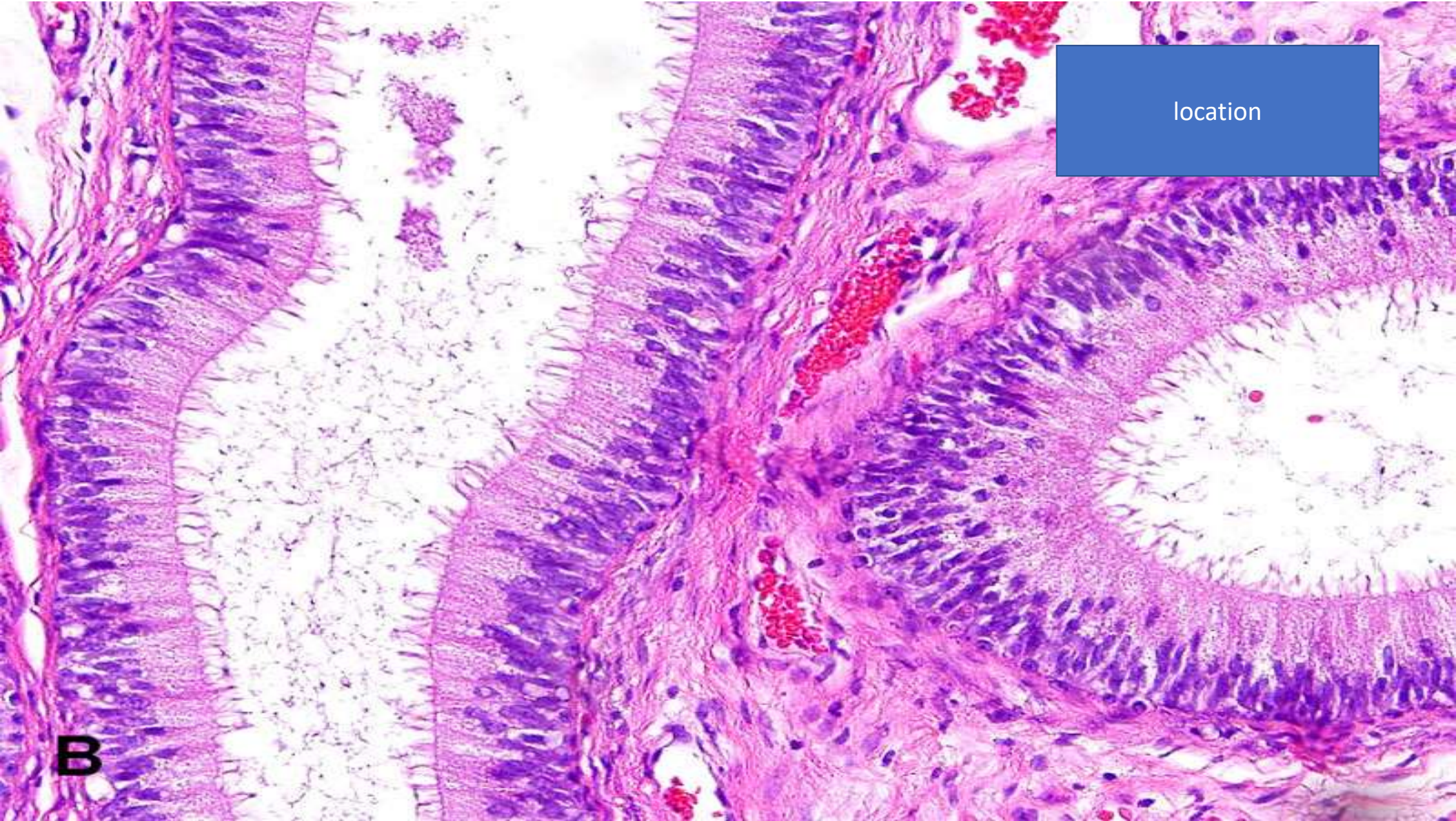


Function of these cells?

Leydig cells: abundant pink cytoplasm

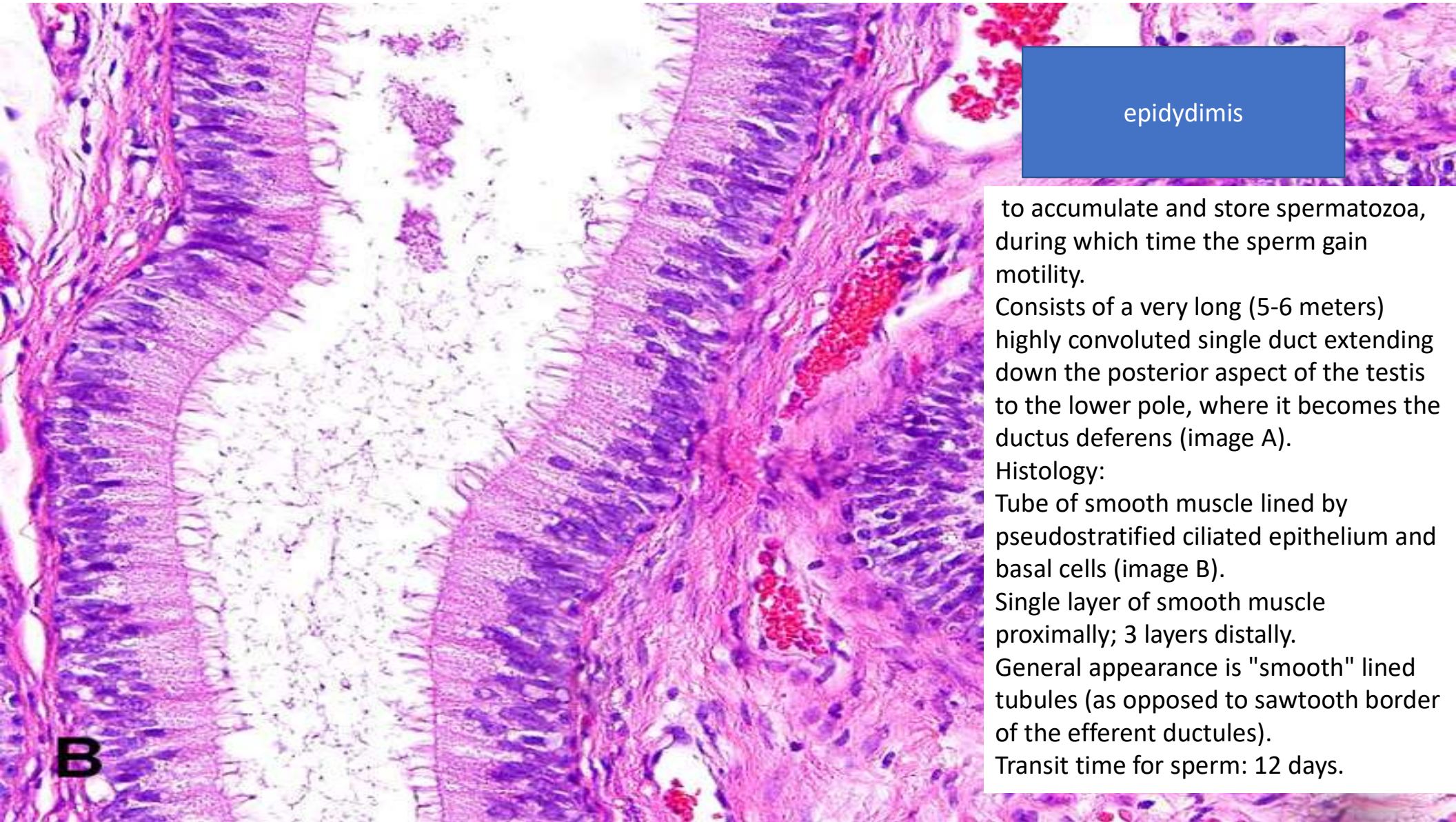
Leydig cells
Produce testosterone.
Have round nuclei with 1-2 prominent nucleoli and abundant bright pink (eosinophilic) cytoplasm
The cytoplasm may contain lipofuscin pigment (golden-yellow) or cytoplasmic granules known as the crystals of Reinke.

D



location

B



epididymis

to accumulate and store spermatozoa, during which time the sperm gain motility.

Consists of a very long (5-6 meters) highly convoluted single duct extending down the posterior aspect of the testis to the lower pole, where it becomes the ductus deferens (image A).

Histology:

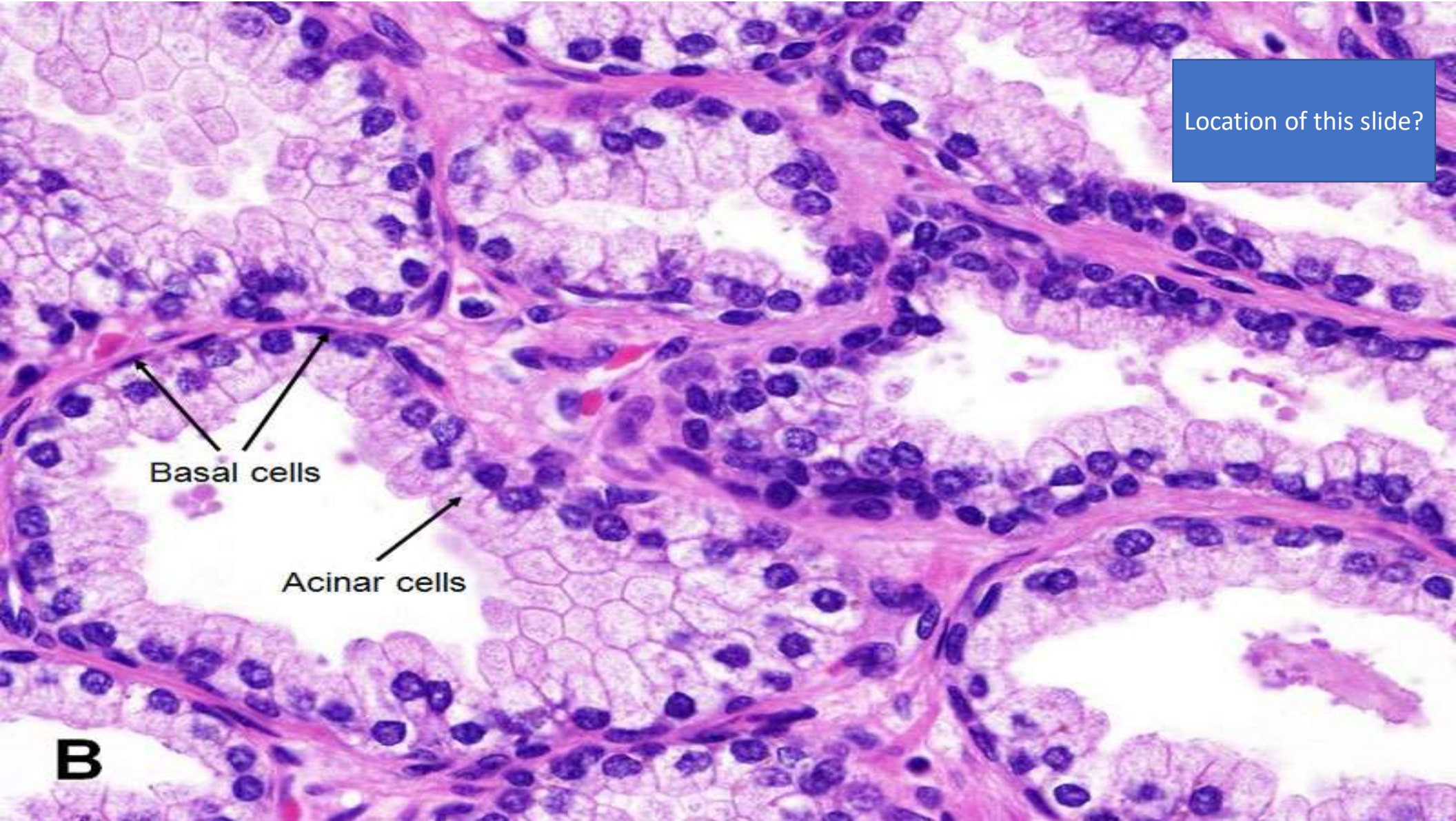
Tube of smooth muscle lined by pseudostratified ciliated epithelium and basal cells (image B).

Single layer of smooth muscle proximally; 3 layers distally.

General appearance is "smooth" lined tubules (as opposed to sawtooth border of the efferent ductules).

Transit time for sperm: 12 days.

Location of this slide?

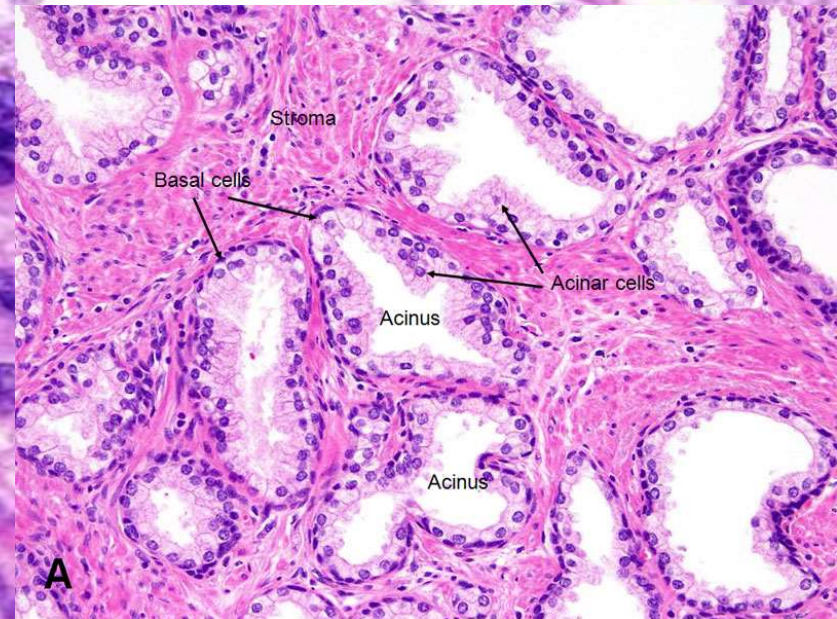
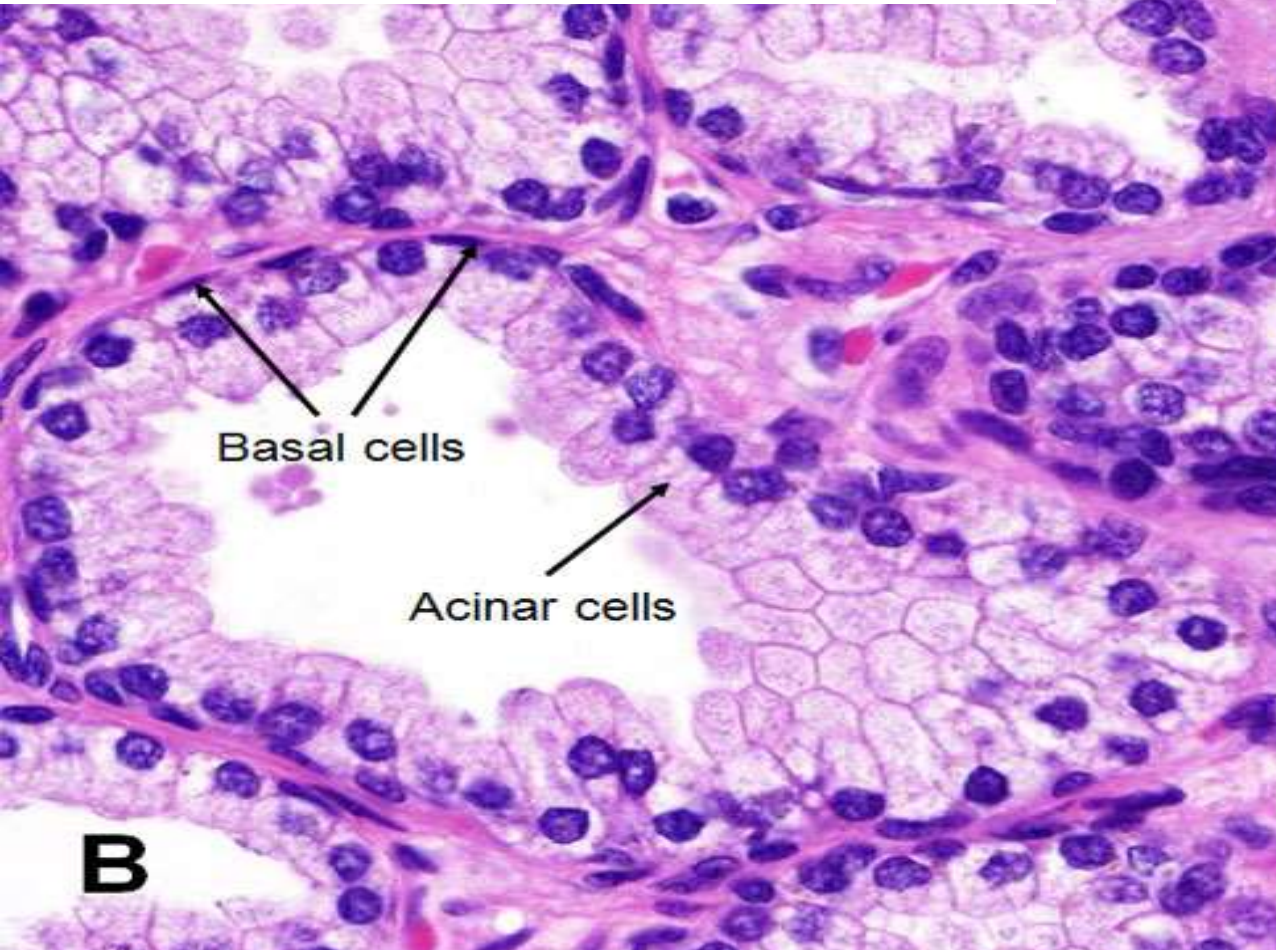
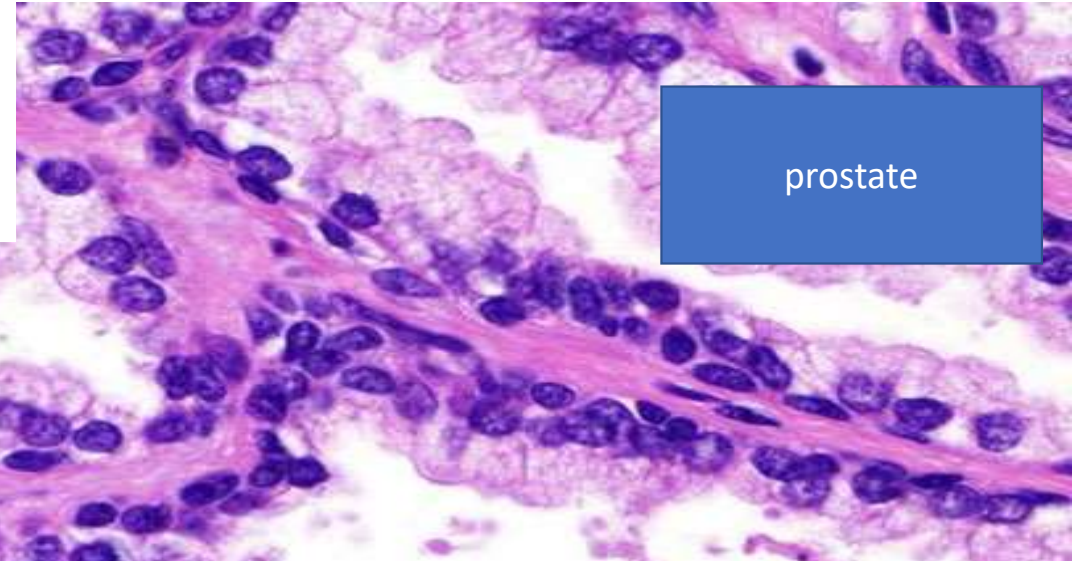


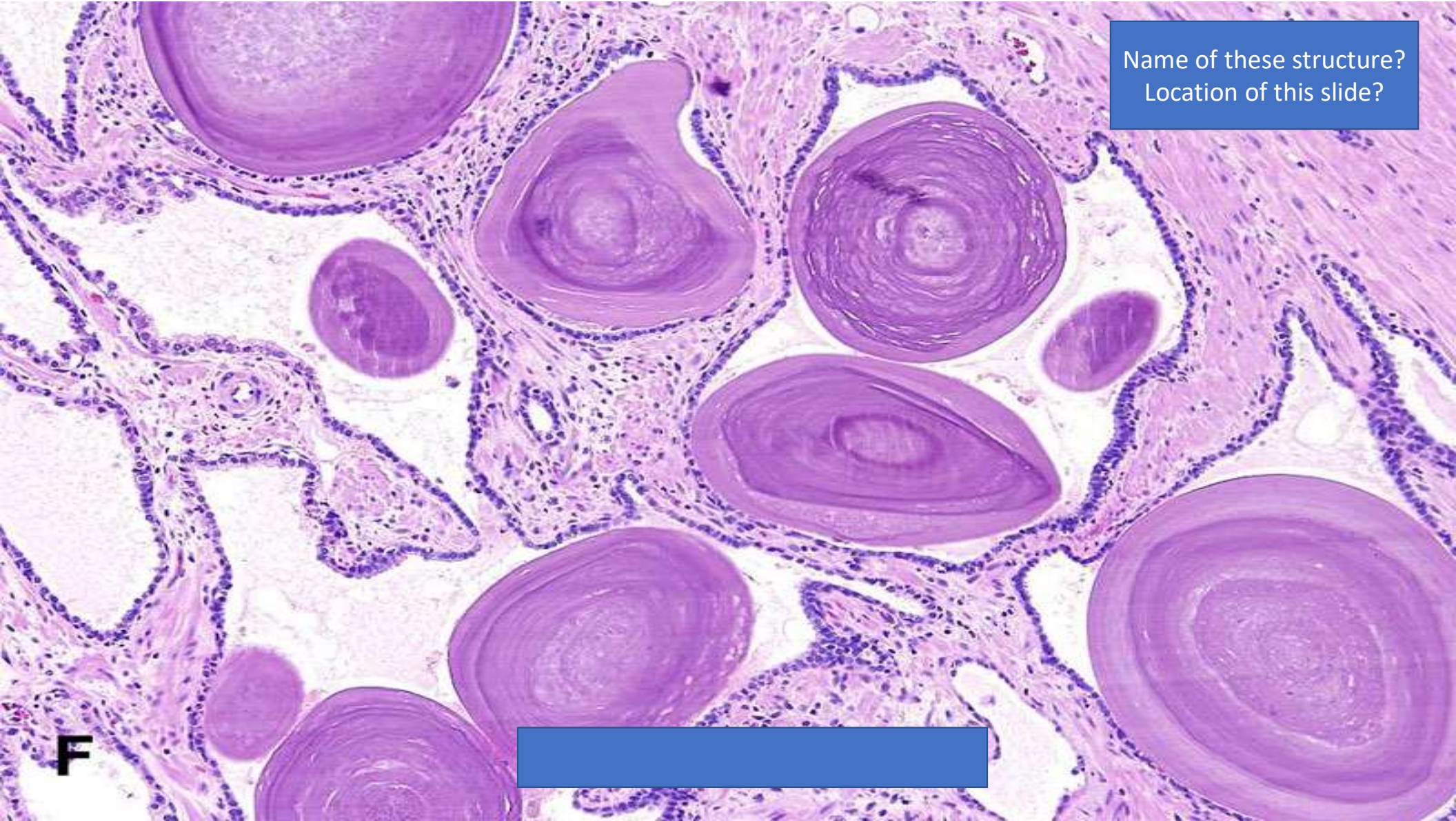
Basal cells

Acinar cells

B

Secretes a thin milky fluid that comprises ~1/3 of seminal fluid.
Microanatomy: divided into glandular (the bulk) and non-glandular parts.
Glandular prostate divided into peripheral zone (PZ, 70%), central zone (CZ, 25%),
transition zone (TZ, 5%)*, and periurethral gland region.
Most common cancer are in PZ (~75%), followed by TZ (~15%).
Non-glandular part is mainly the anterior fibromuscular stroma and sphincters.





Name of these structure?
Location of this slide?

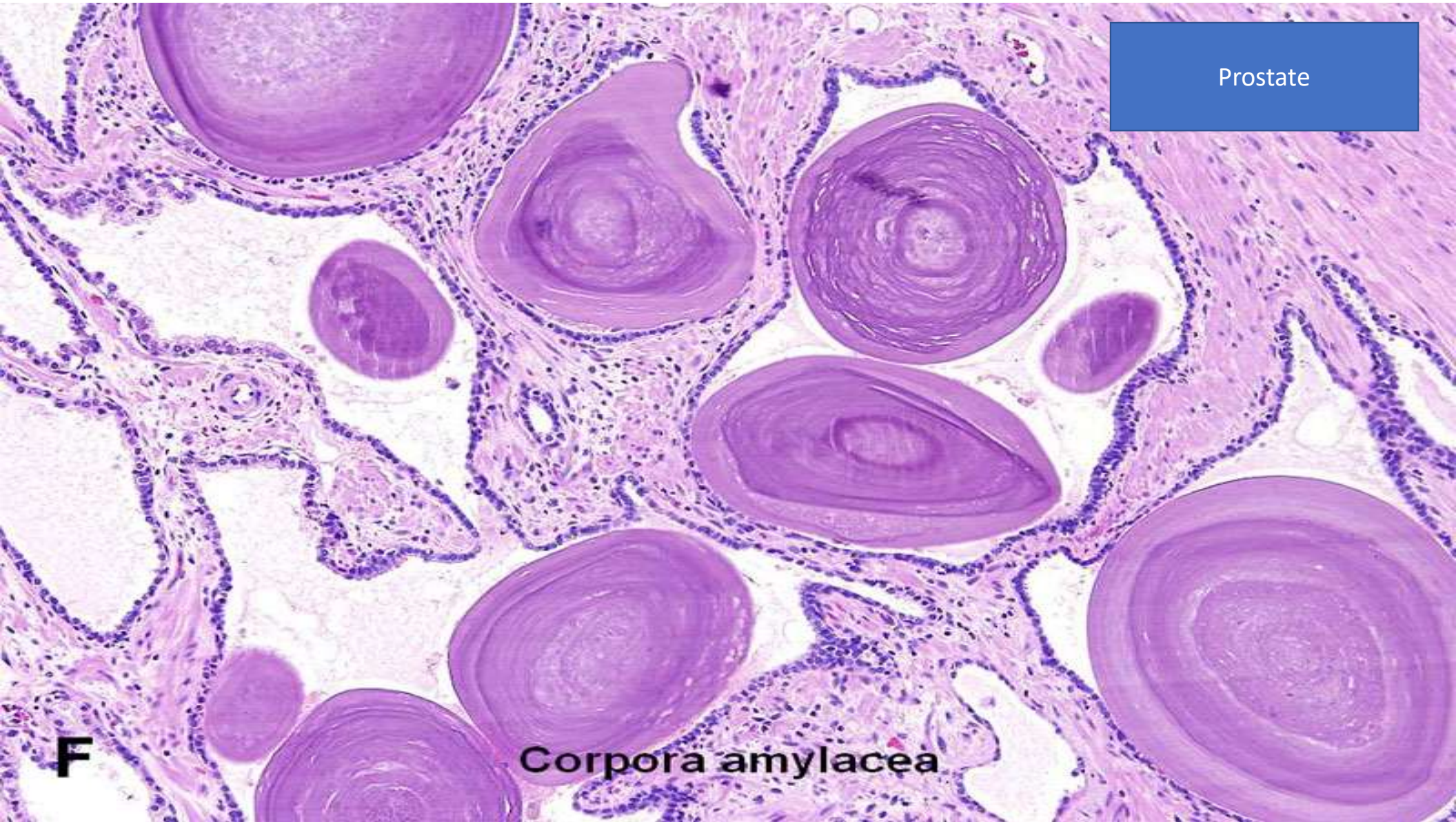
F

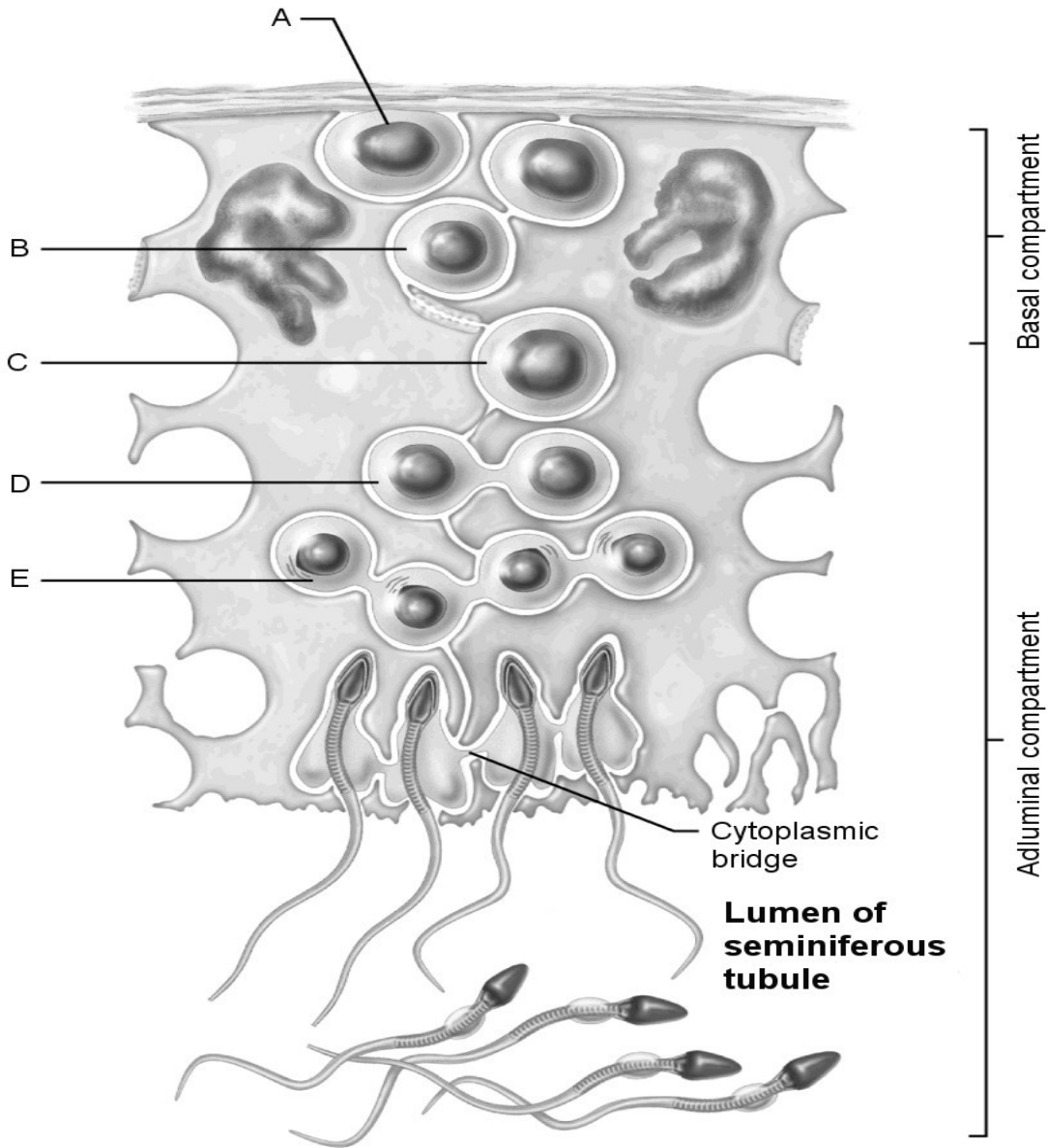
[Redacted]

Prostate

Corpora amylacea

F





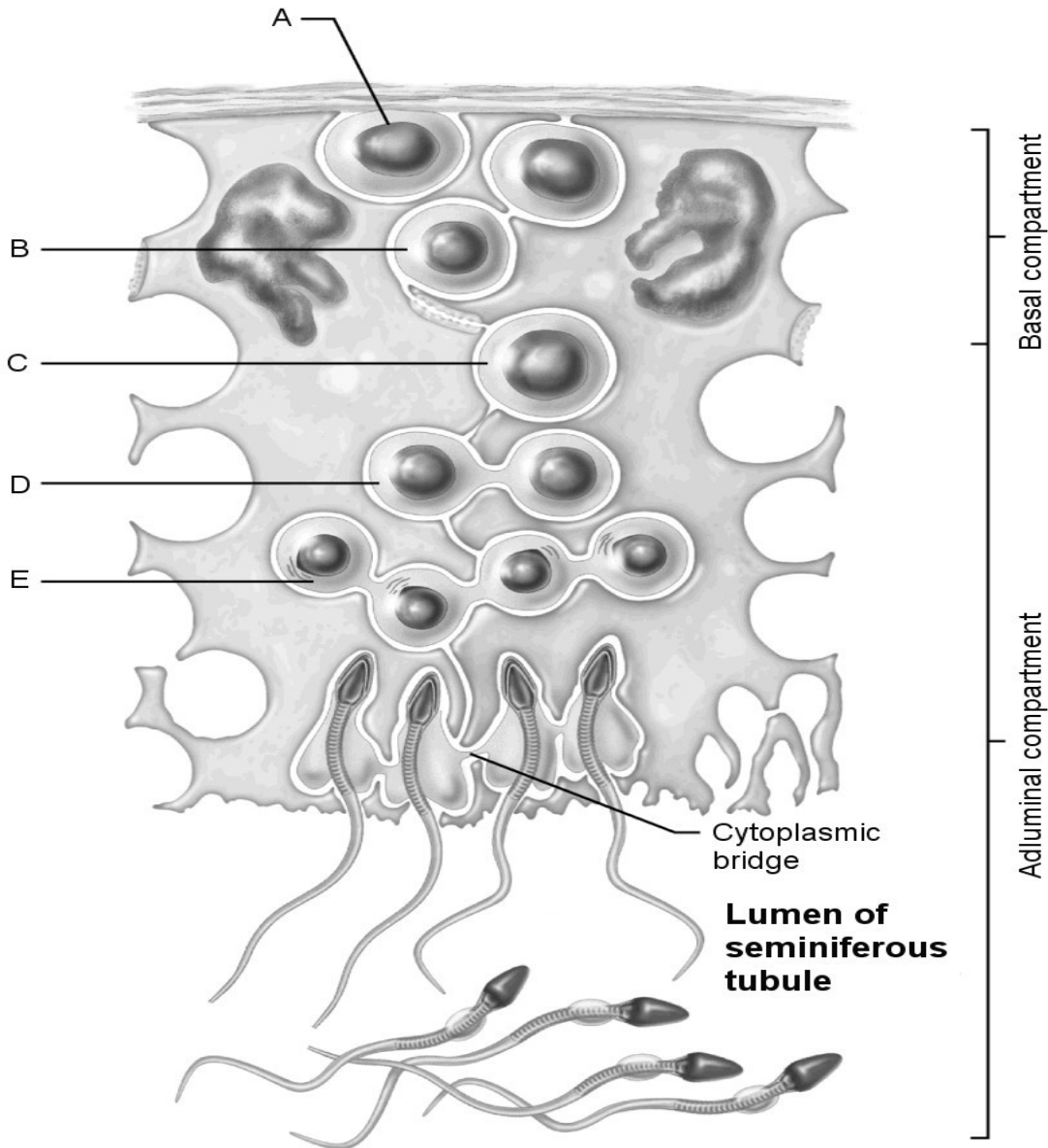
54) Stem cell.

55) First cells with n number of chromosomes.

56) Type B spermatogonia.

57) Early spermatids.

58) Primary spermatocyte.



54) Stem cell.

Answer: A

55) First cells with n number of chromosomes.

Answer: D

56) Type B spermatogonia.

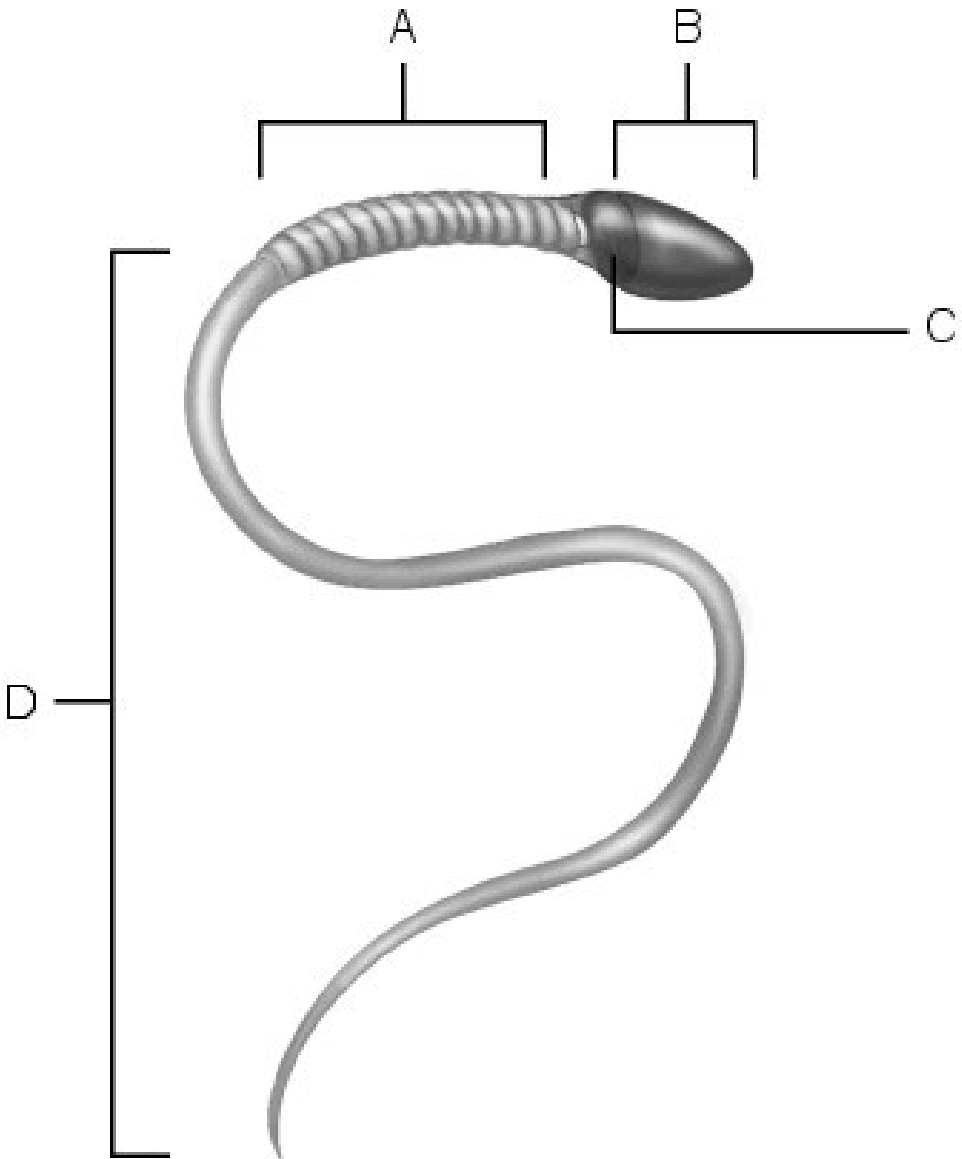
Answer: B

57) Early spermatids.

Answer: E

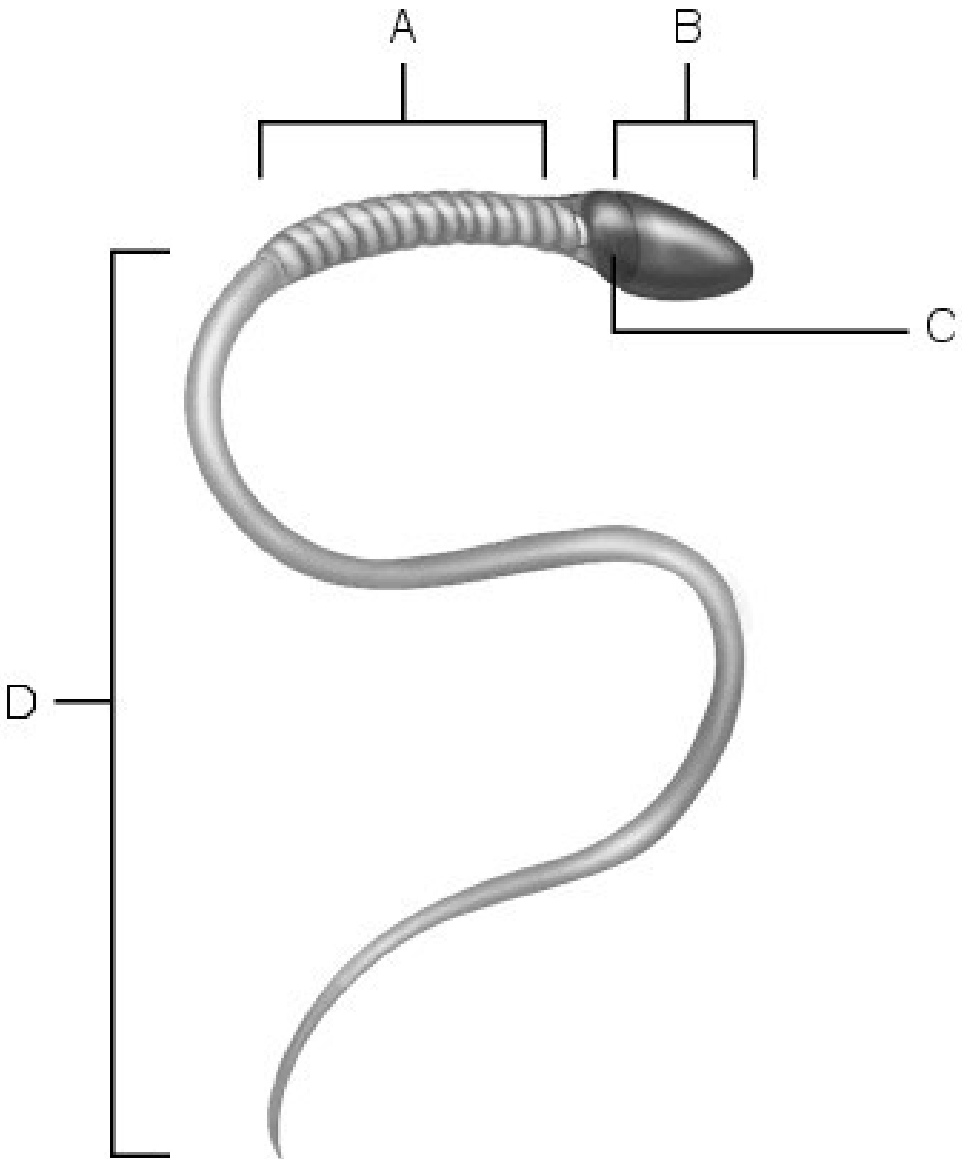
58) Primary spermatocyte.

Answer: C



match the following:

- 59) Acrosome.
- 60) Location of mitochondria.
- 61) Midpiece.
- 62) Location of nucleus.



match the following:

59) Acrosome.

Answer: B

60) Location of mitochondria.

Answer: A

61) Midpiece.

Answer: A

62) Location of nucleus.

Answer: C



73/Where this pictures has been taking from?

- A/ VAGINA**
- B/BREAST**
- C/PENIS**
- D/URETHRA**
- E/URETER**



73/Where this pictures has been taking from?

A/ VAGINA

B/BREAST

C/PENIS

D/URETHRA

E/URETER

83/ Identify 1

A/ Leydig cells

B/Sertoli cells

C/ interstitial cells

d/a,b correct

e/a,c correct

84/ FUNCTION OF #1

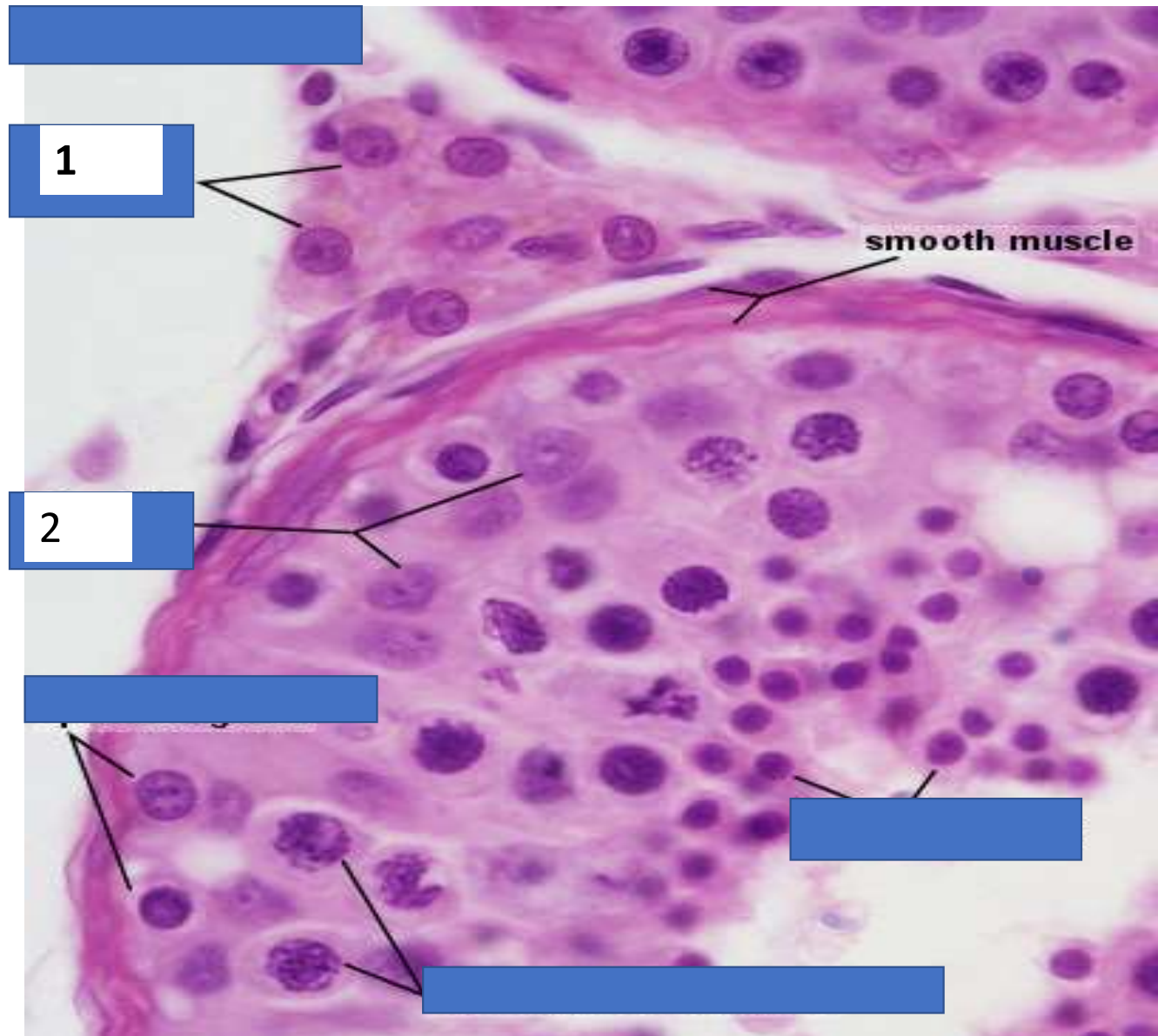
A/ They produce testosterone in the presence of luteinizing hormone (LH).

B/ They produce testosterone in the presence of FSH

C/Maintenance and protection

D/ They produce Estrogen in the presence of luteinizing hormone (LH).

e/I am confused



83/ Identify 1

A/ Leydig cells

B/Sertoli cells

C/ interstitial cells

d/a,b correct

e/a,c correct

84/ FUNCTION OF #1

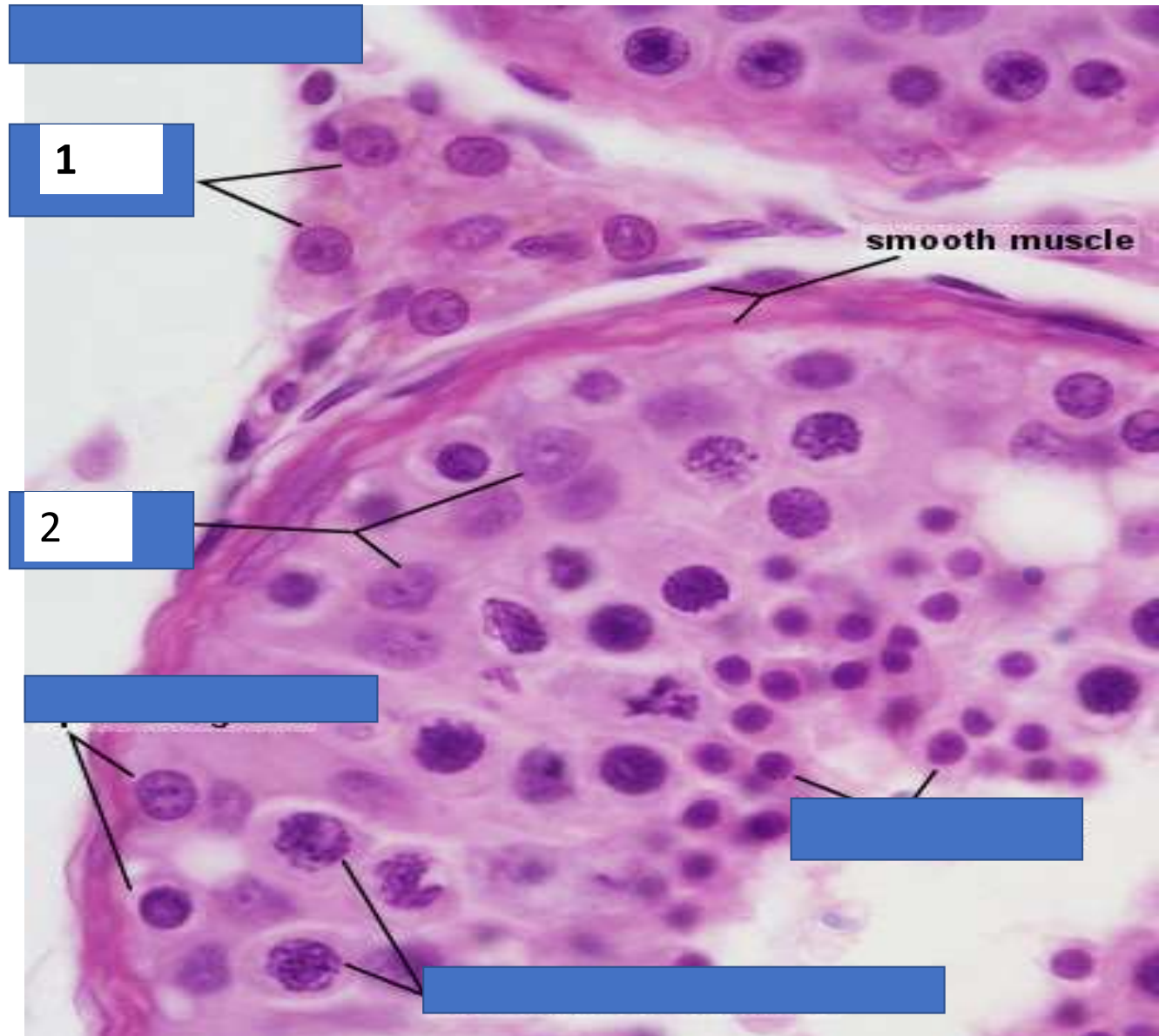
A/ They produce testosterone in the presence of luteinizing hormone (LH).

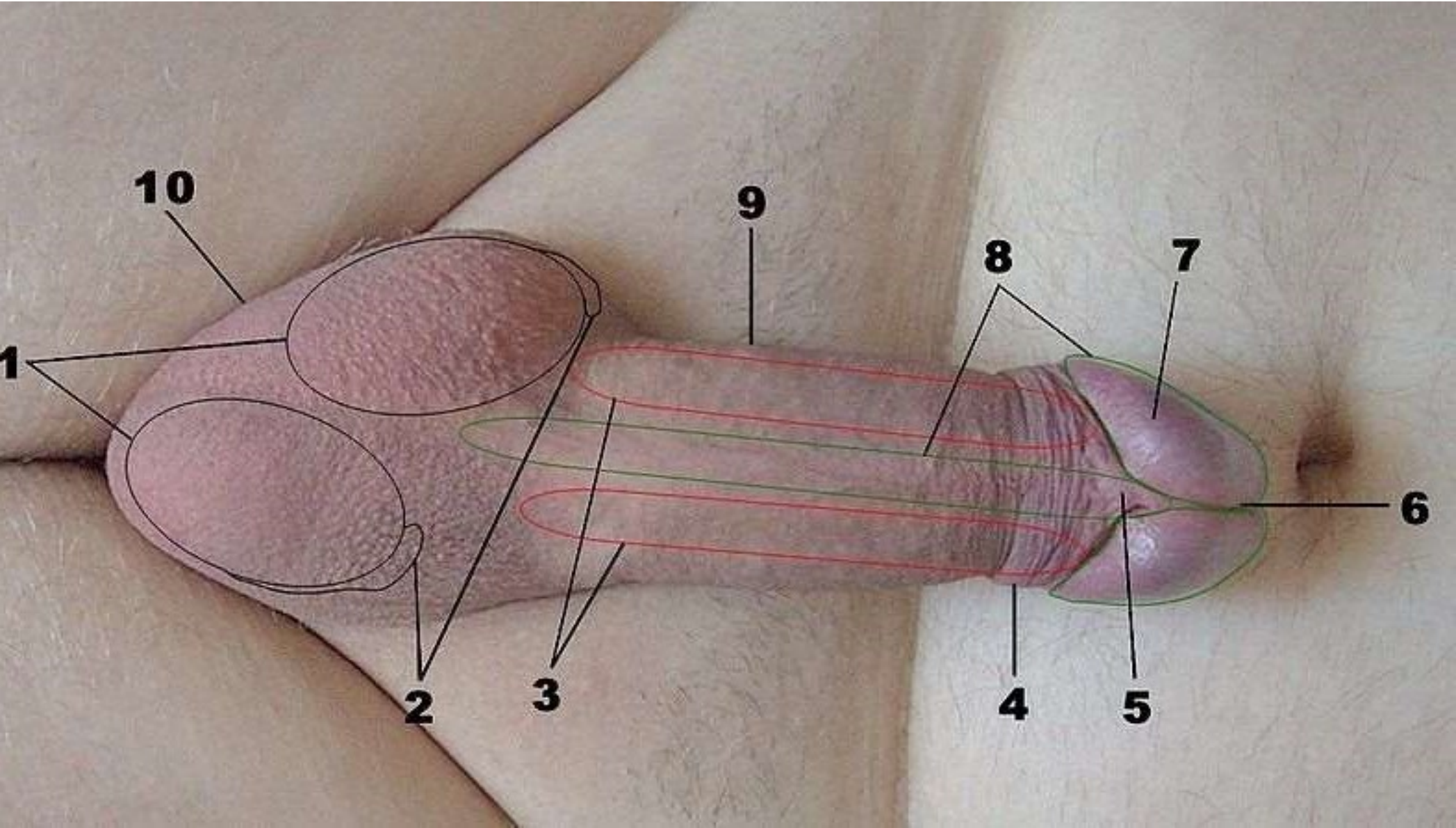
B/ They produce testosterone in the presence of FSH

C/Maintenance and protection

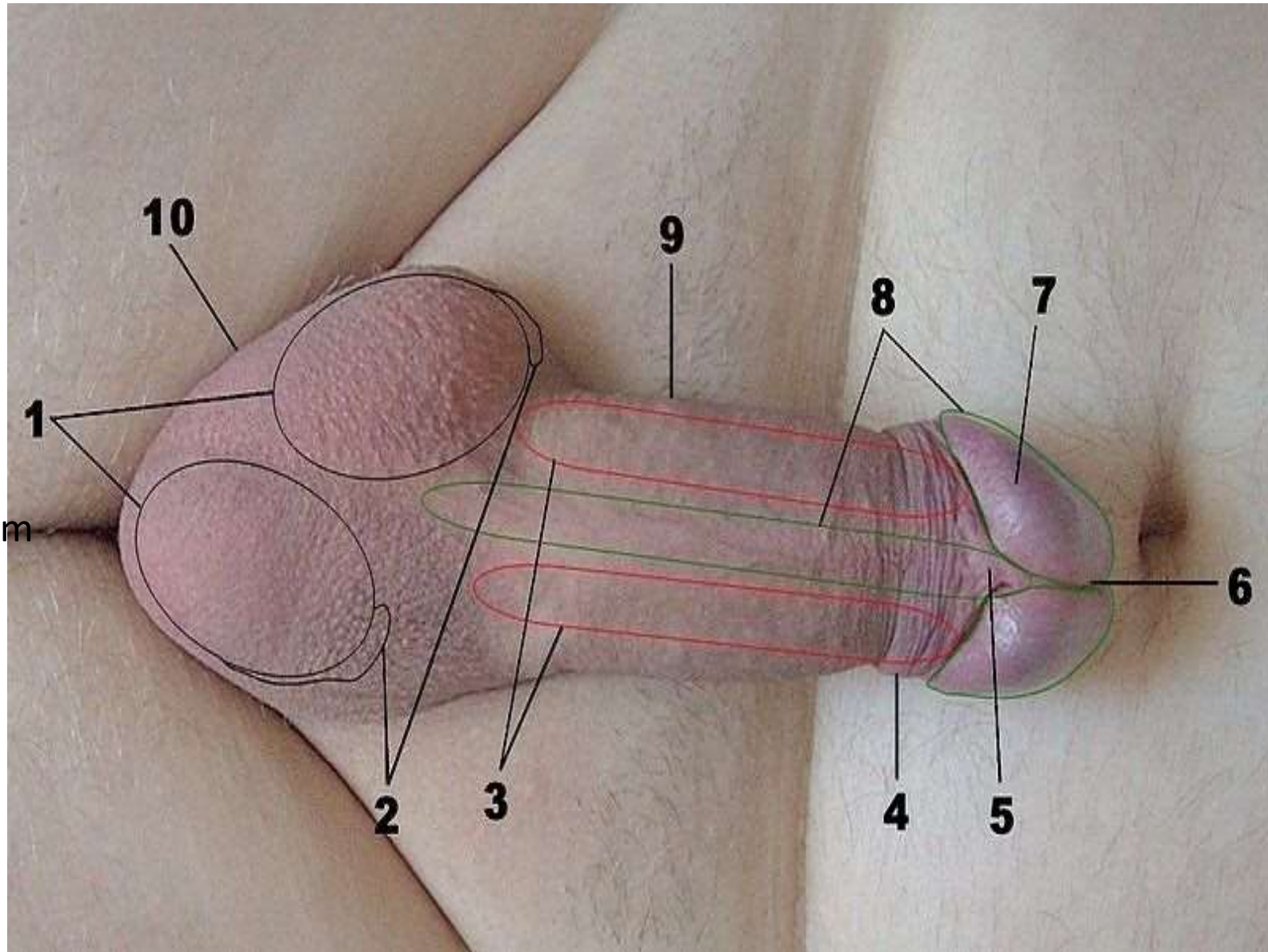
D/ They produce Estrogen in the presence of luteinizing hormone (LH).

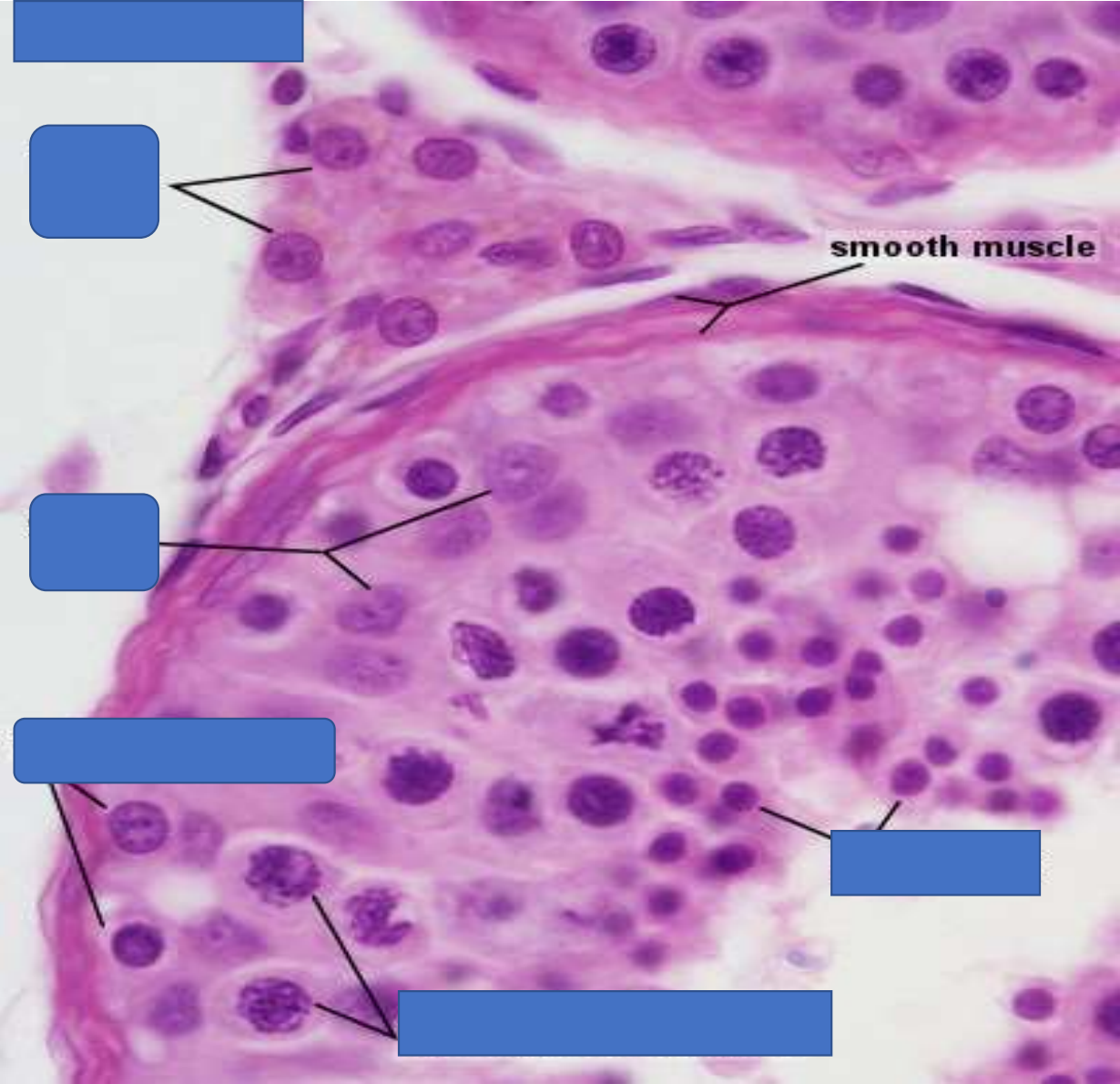
e/I am confused

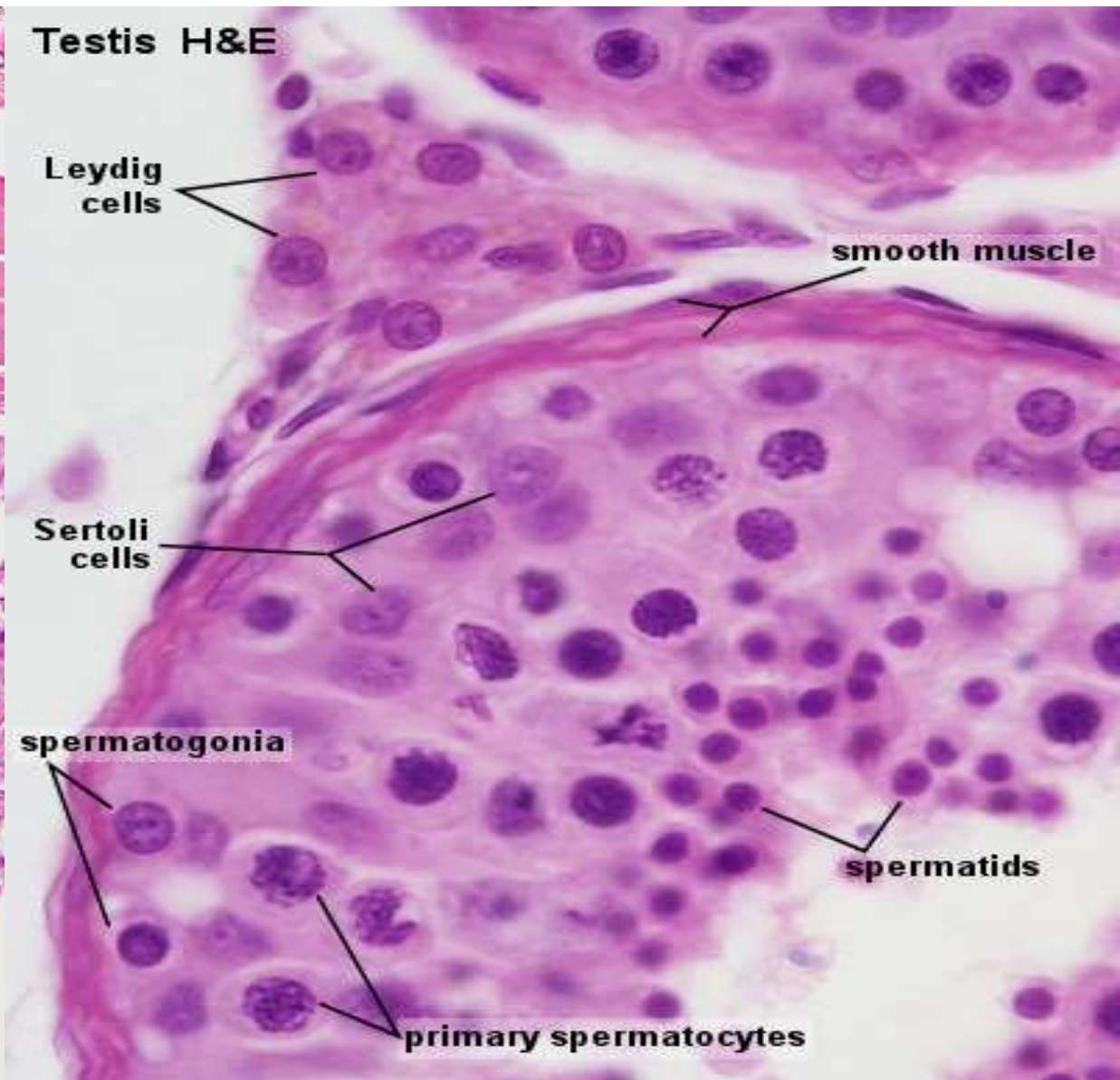
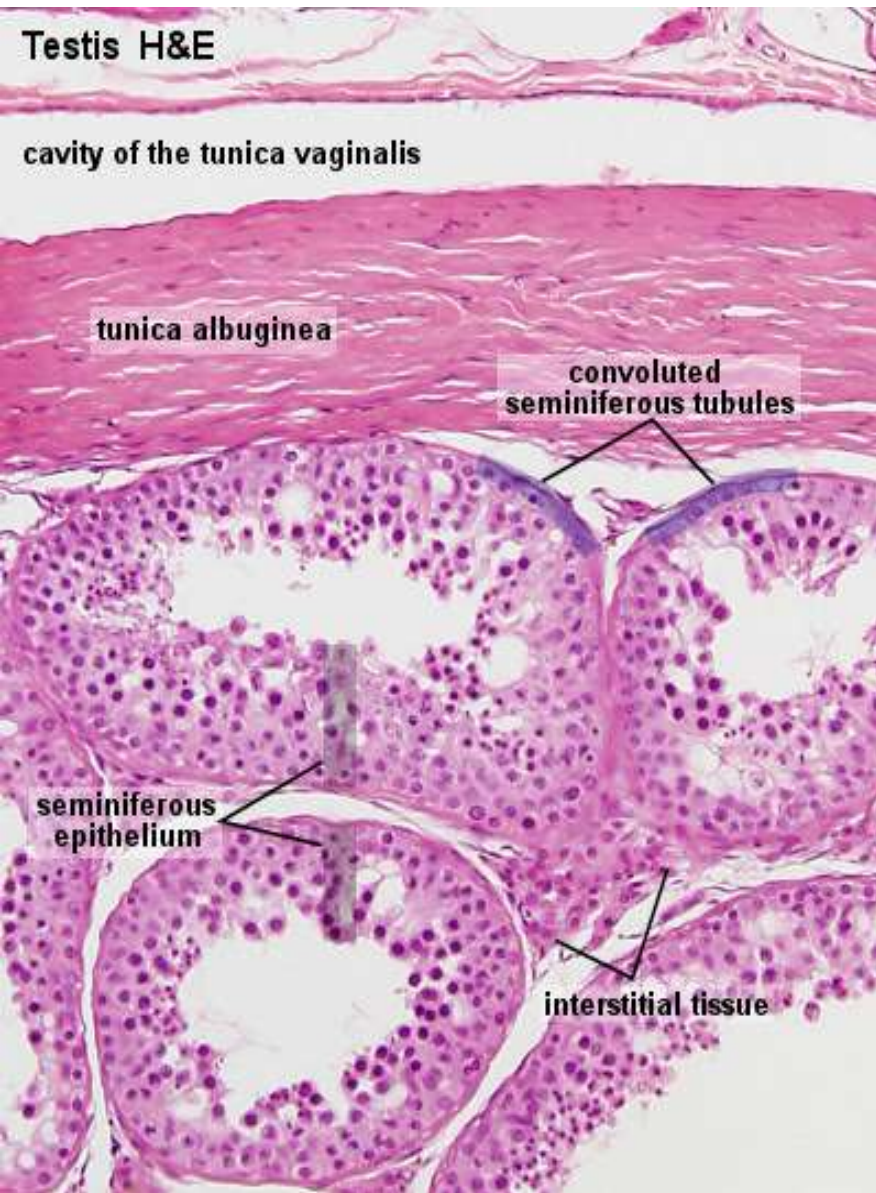


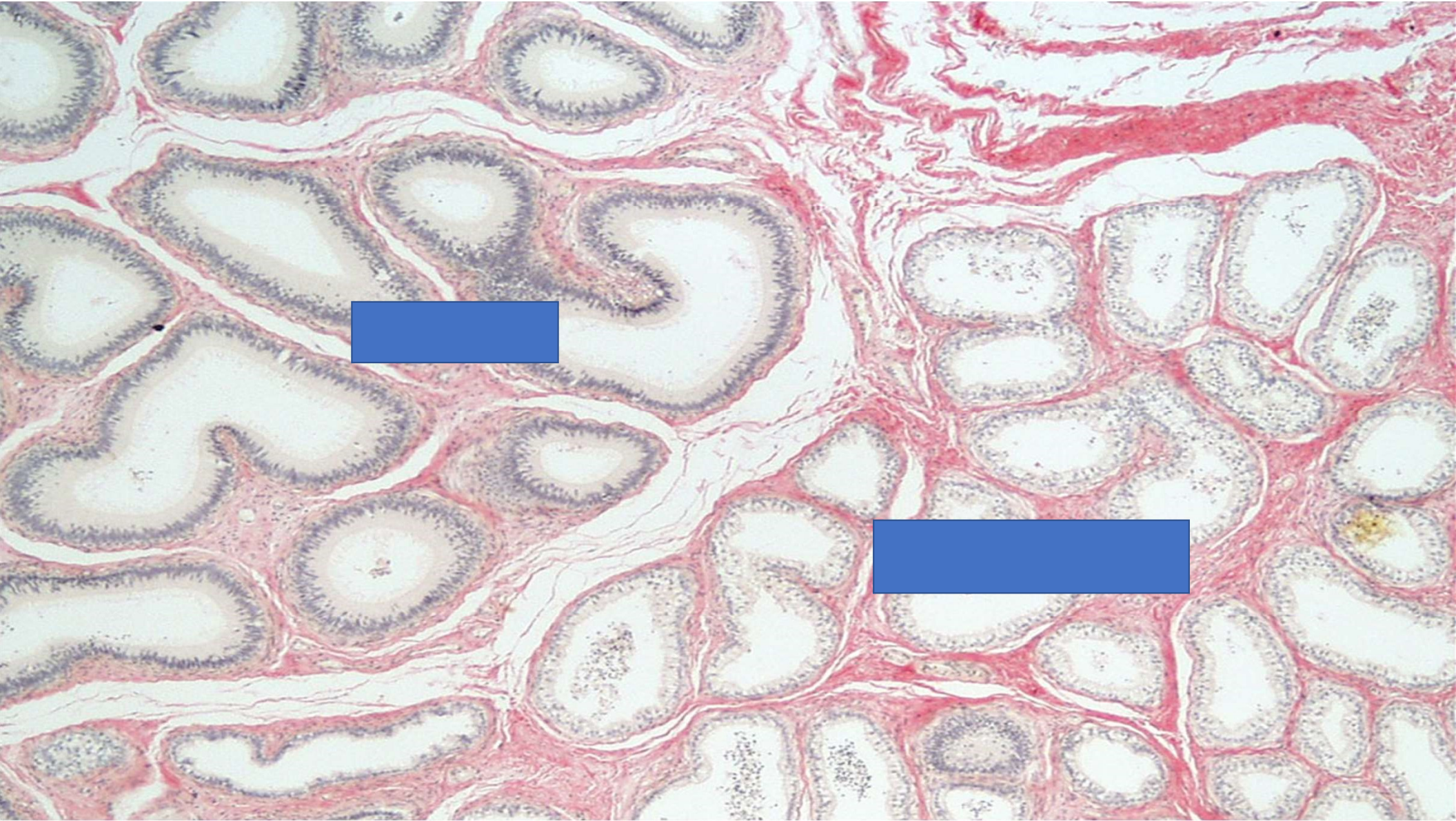


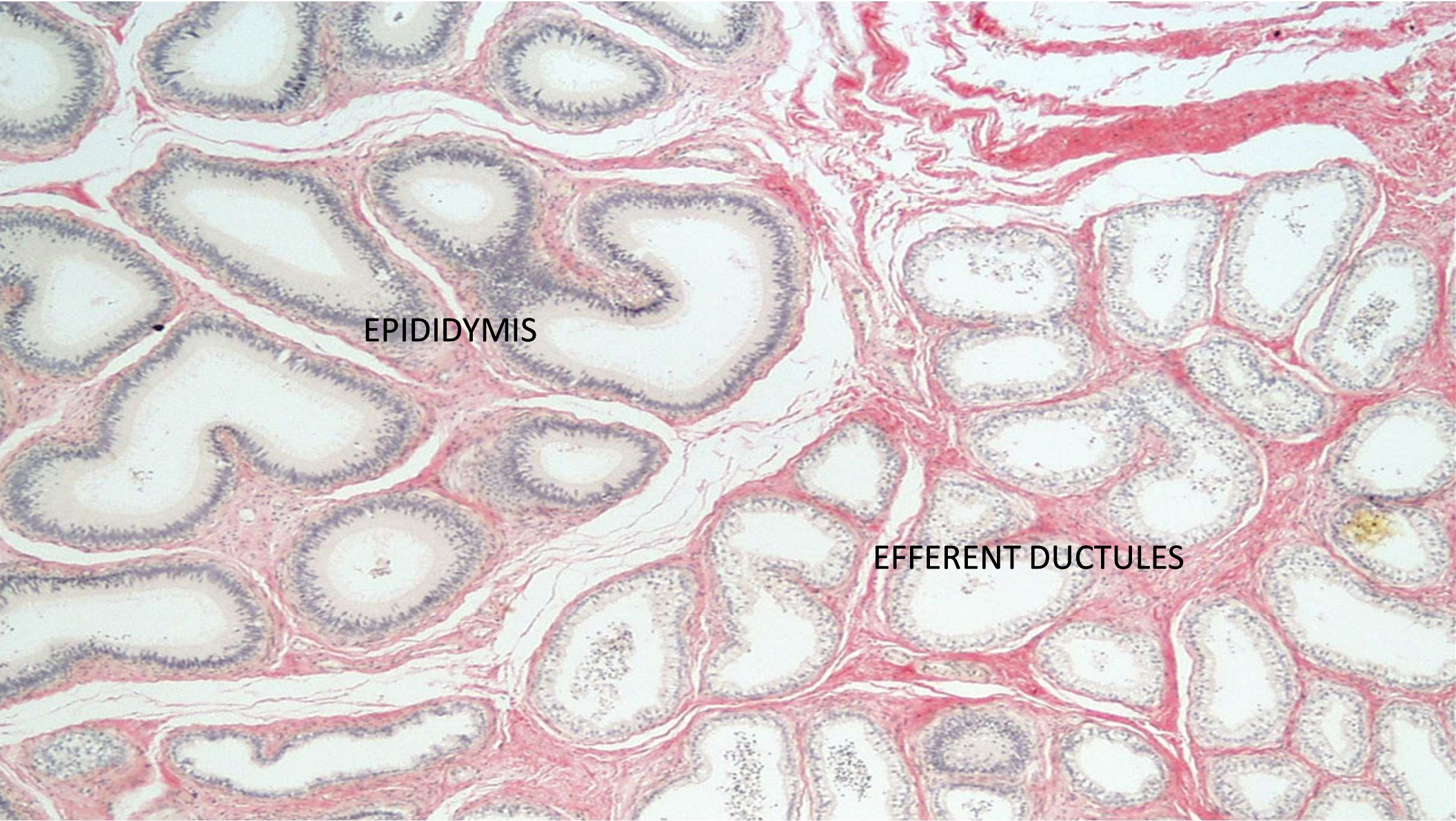
1. Testicles
2. Epididymis
3. Corpus cavernosa
4. Foreskin
5. Frenulum
6. Urethral opening
7. Glans penis
8. Corpus spongiosum
9. Penis
10. Scrotum





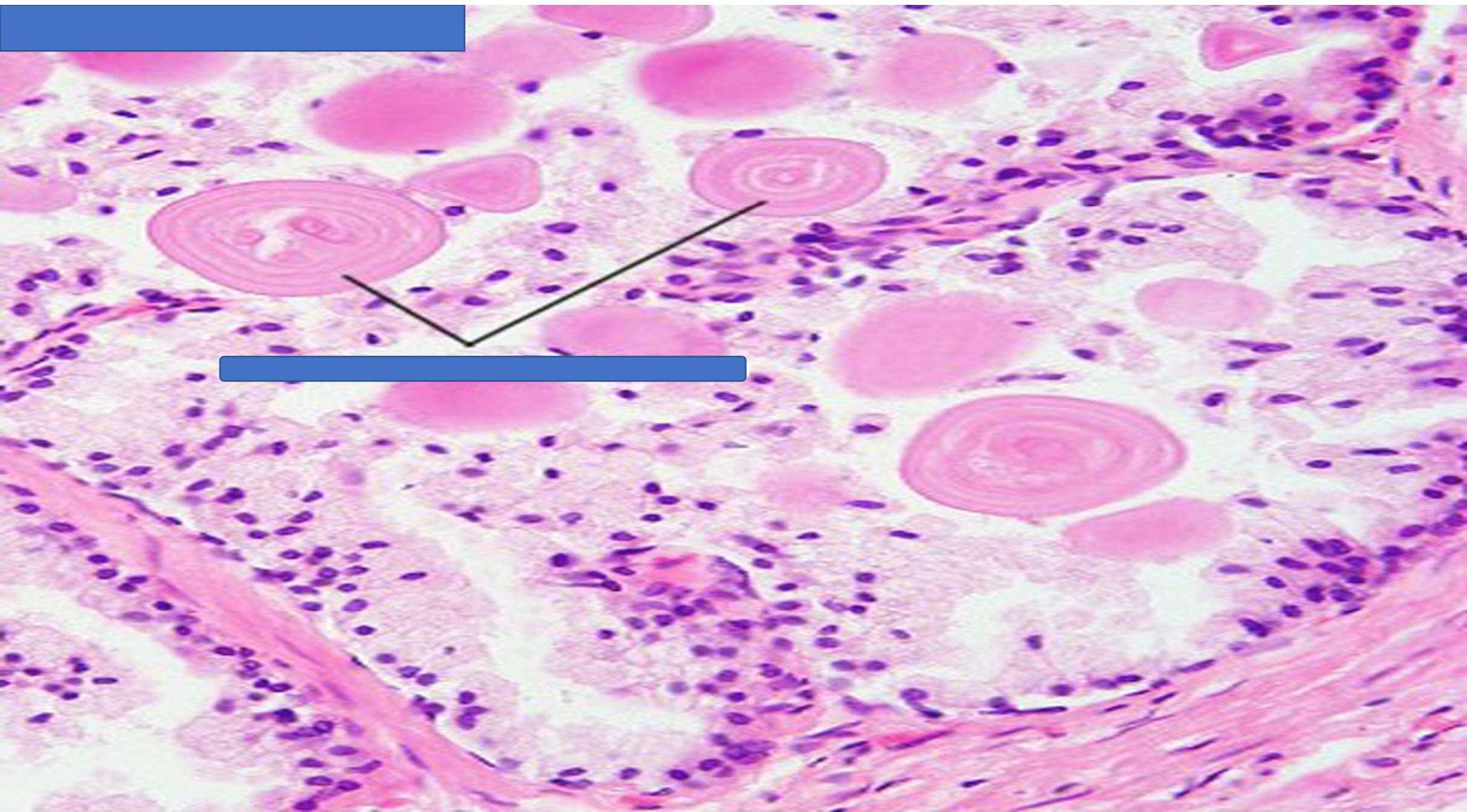






EPIDIDYMIS

EFFERENT DUCTULES



MALE REPRODUCTIVE SYSTEM

- PROSTATE

PROSTATIC CONCRETIONS

- *precipitation of secretory product*

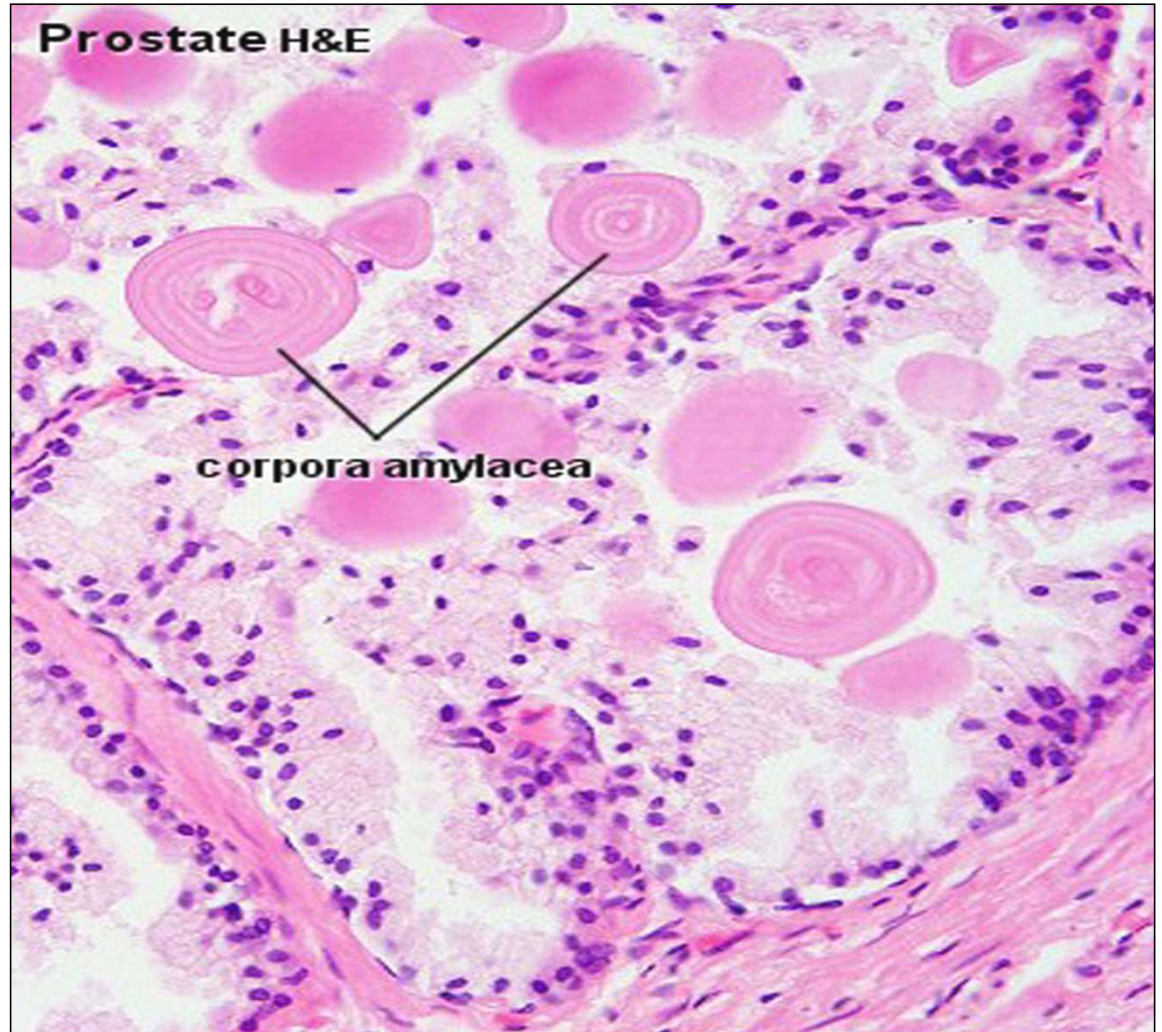
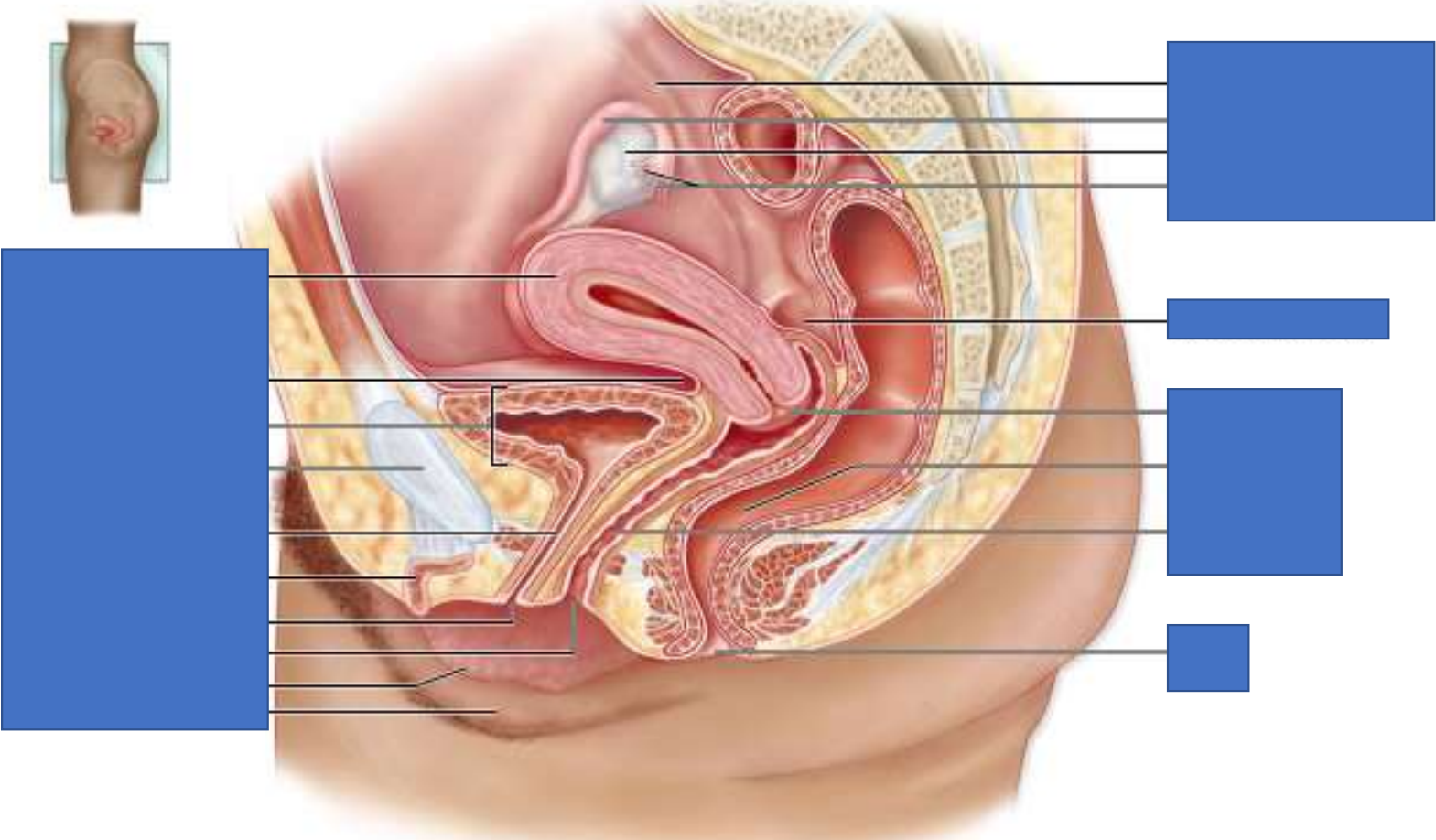


Fig. 28.3a

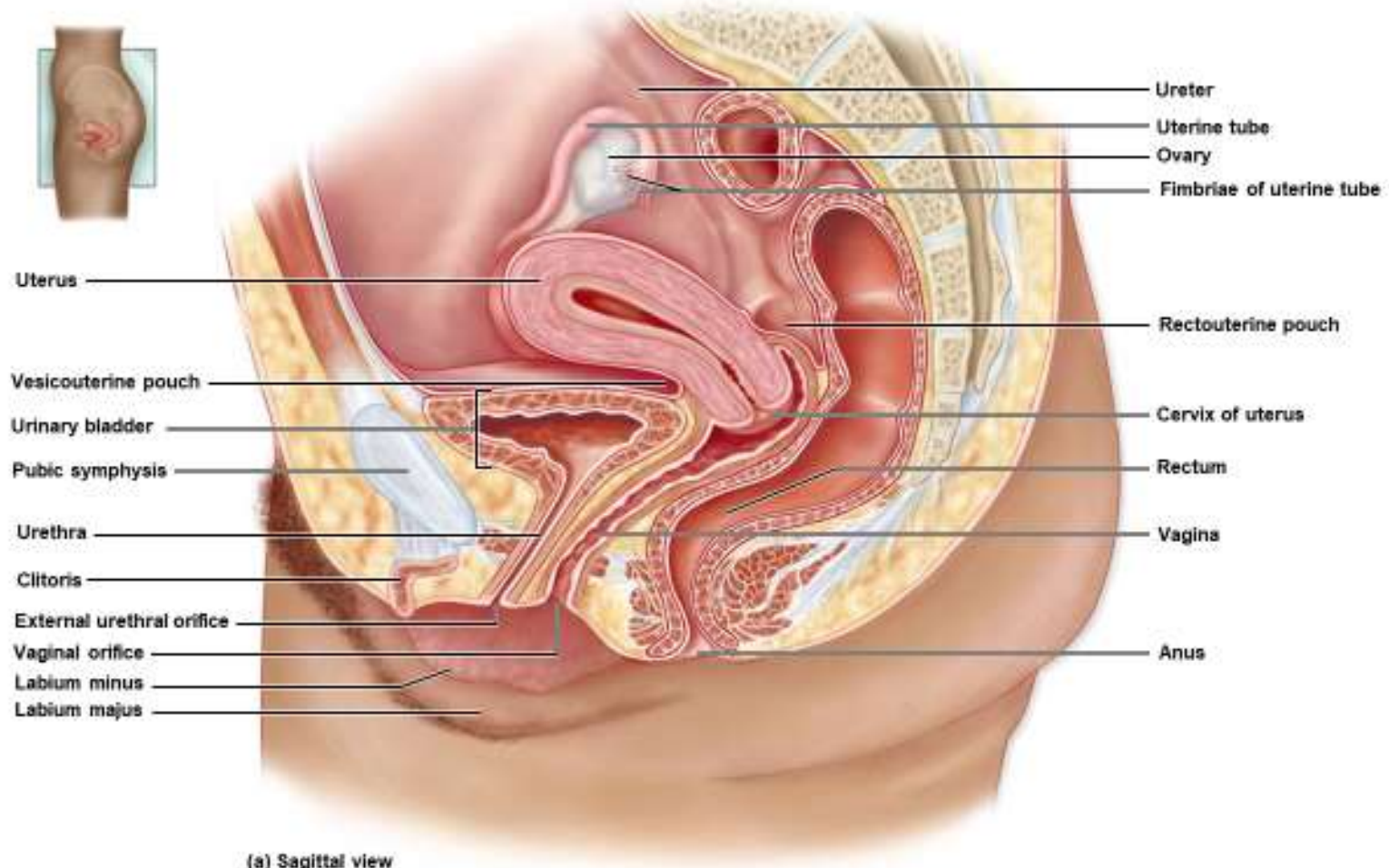
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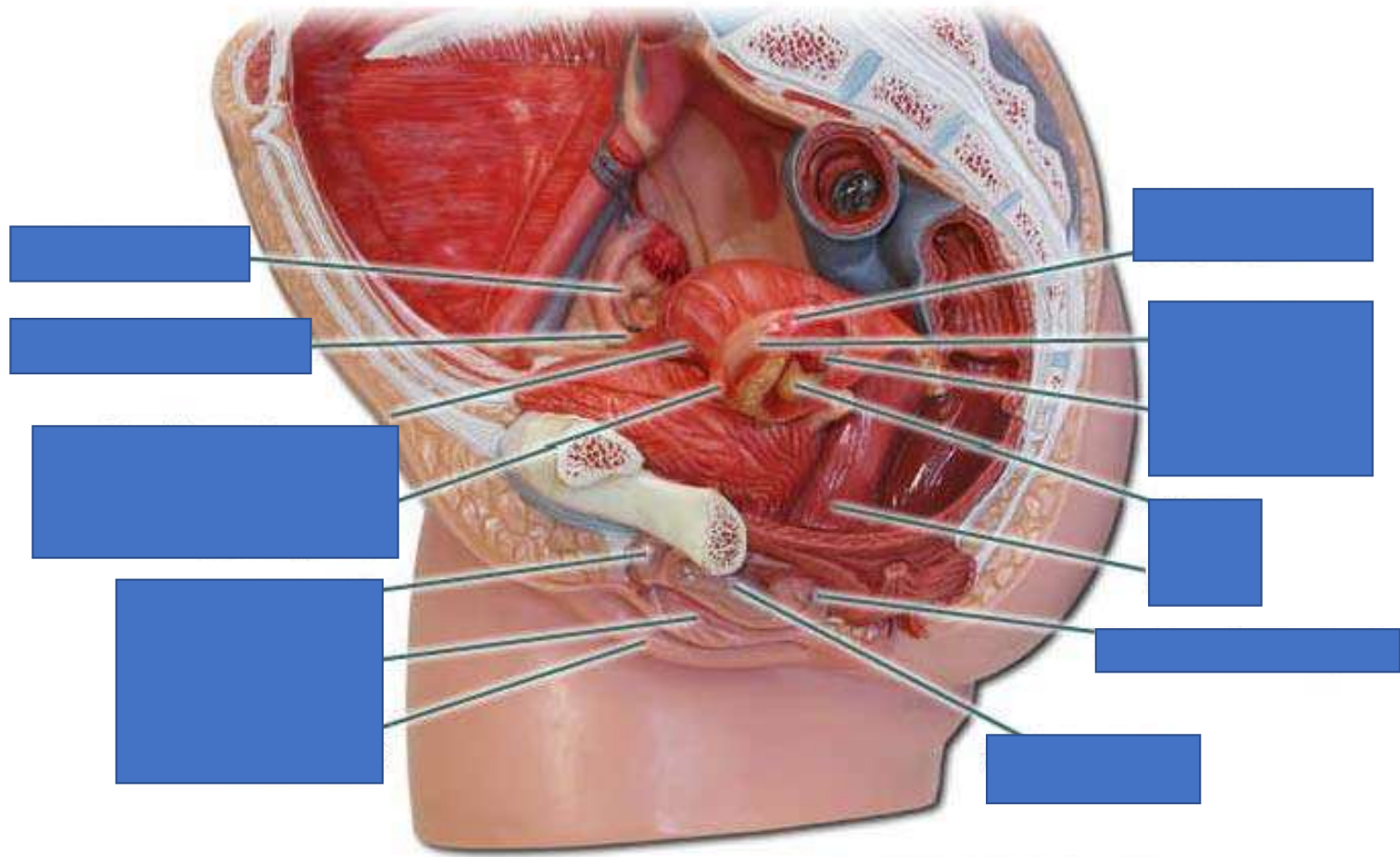
(a) Sagittal view

Fig. 28.3a

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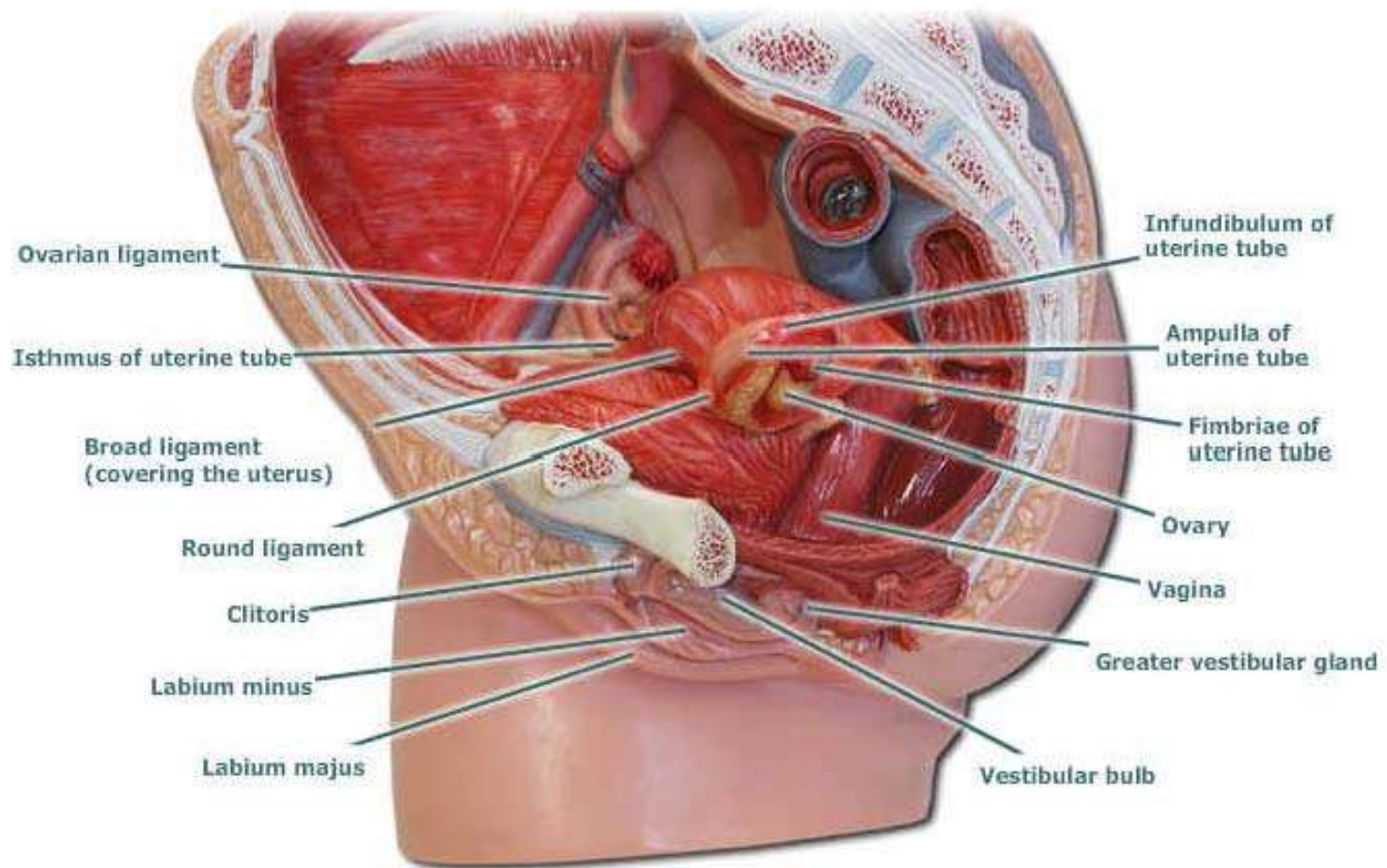


Reproductive organs of the female

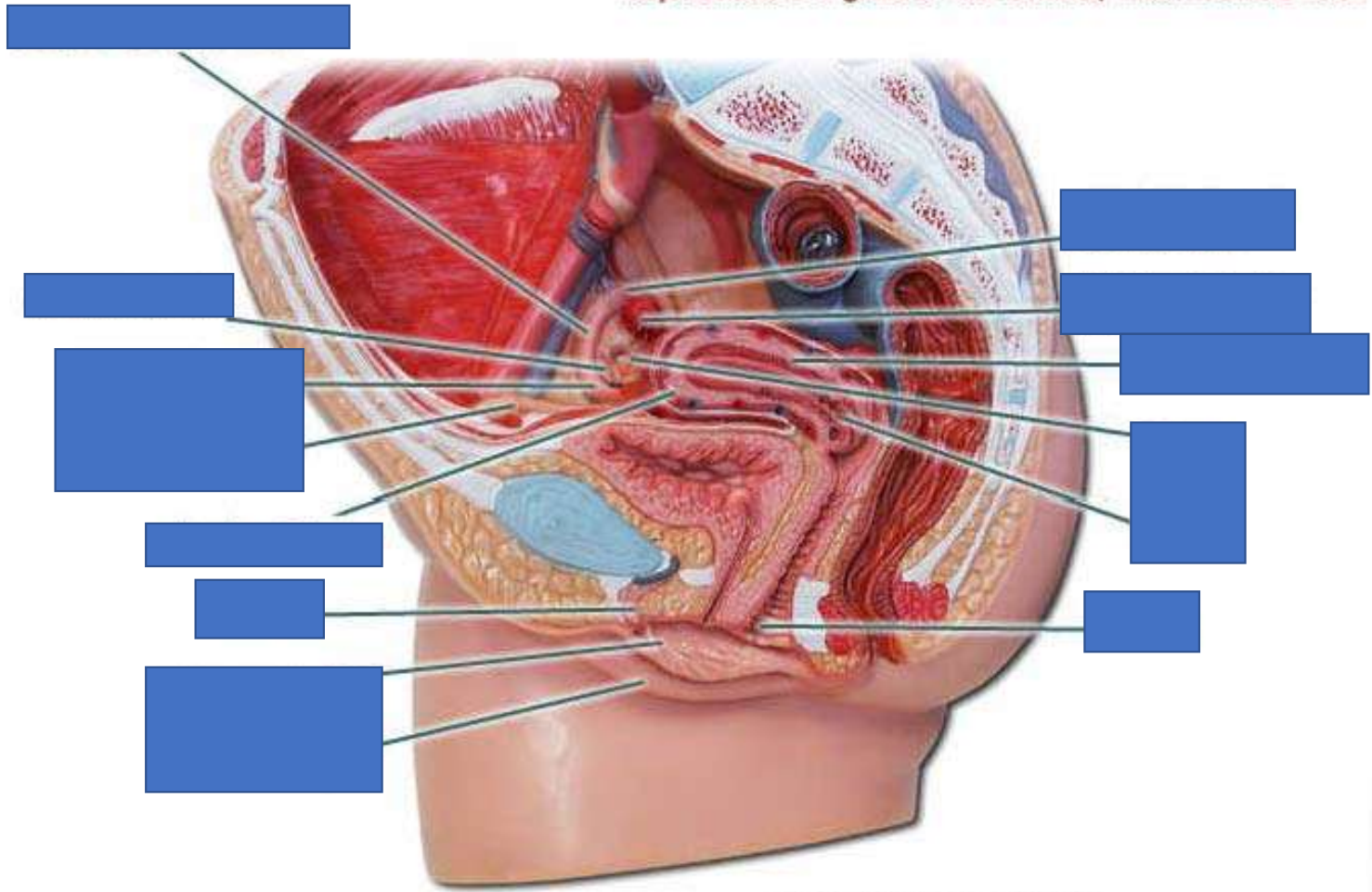


LT-H10: Female Pelvis, 2-part, 3B Scientific®

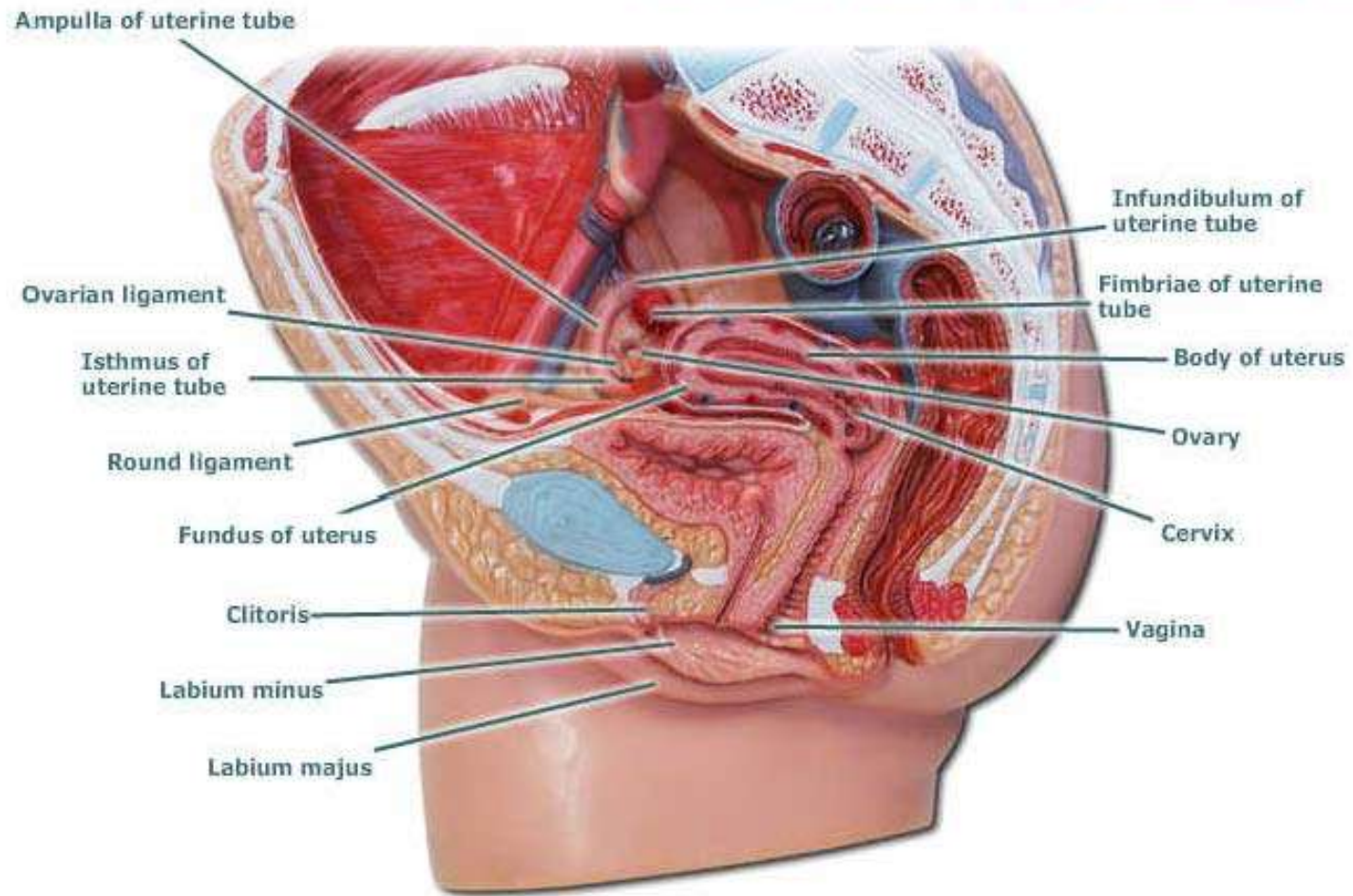
Reproductive organs of the female



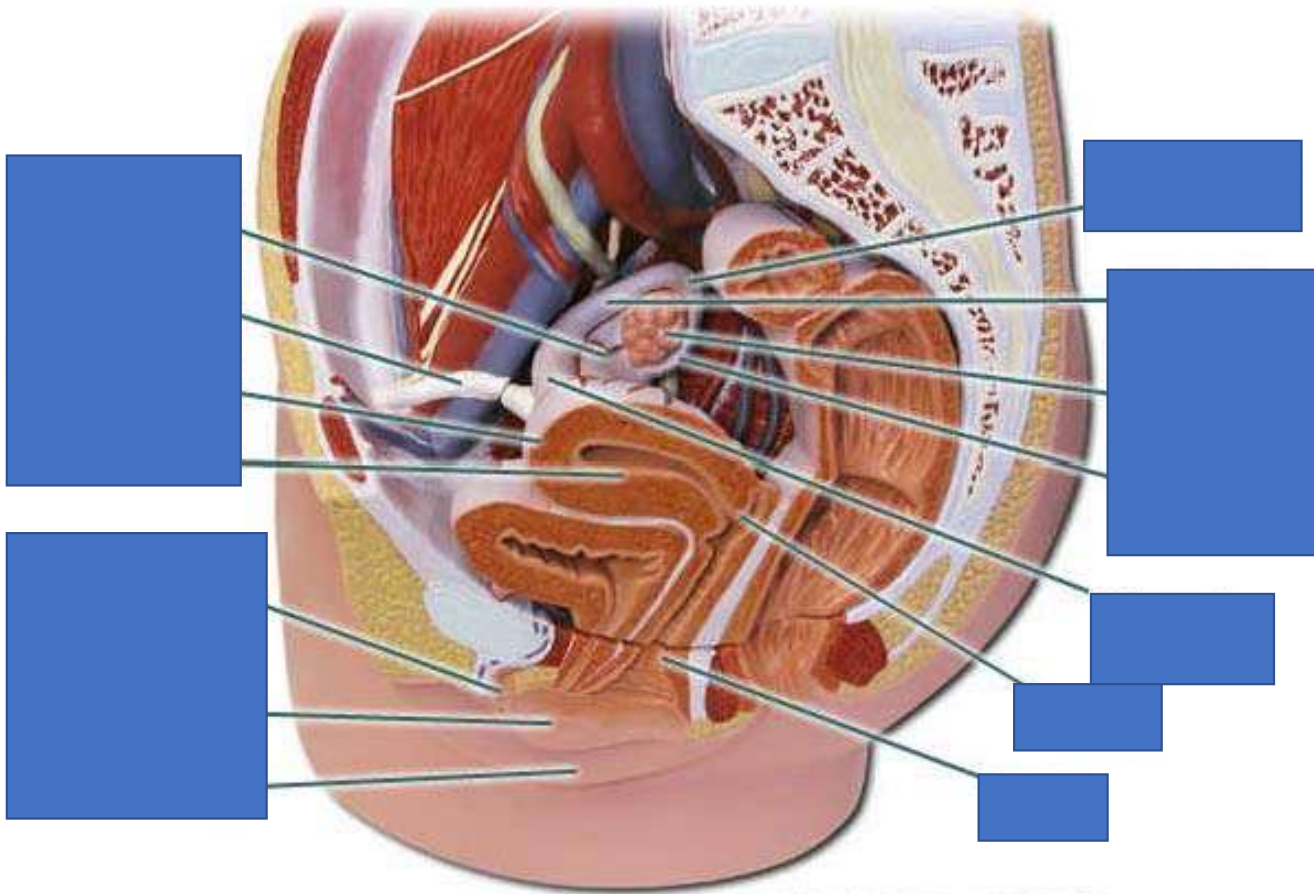
Reproductive organs of the female, intermediate view



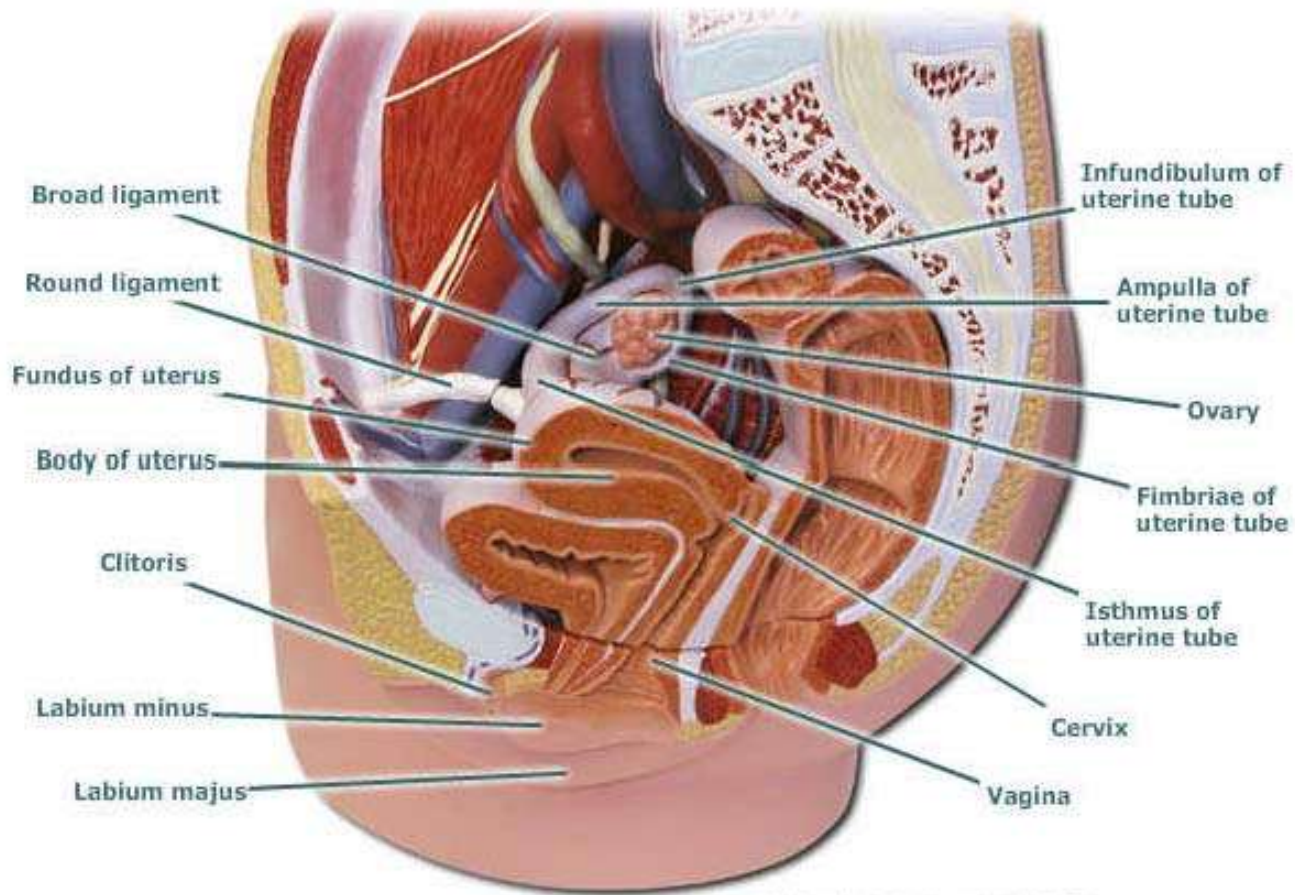
Reproductive organs of the female, intermediate view



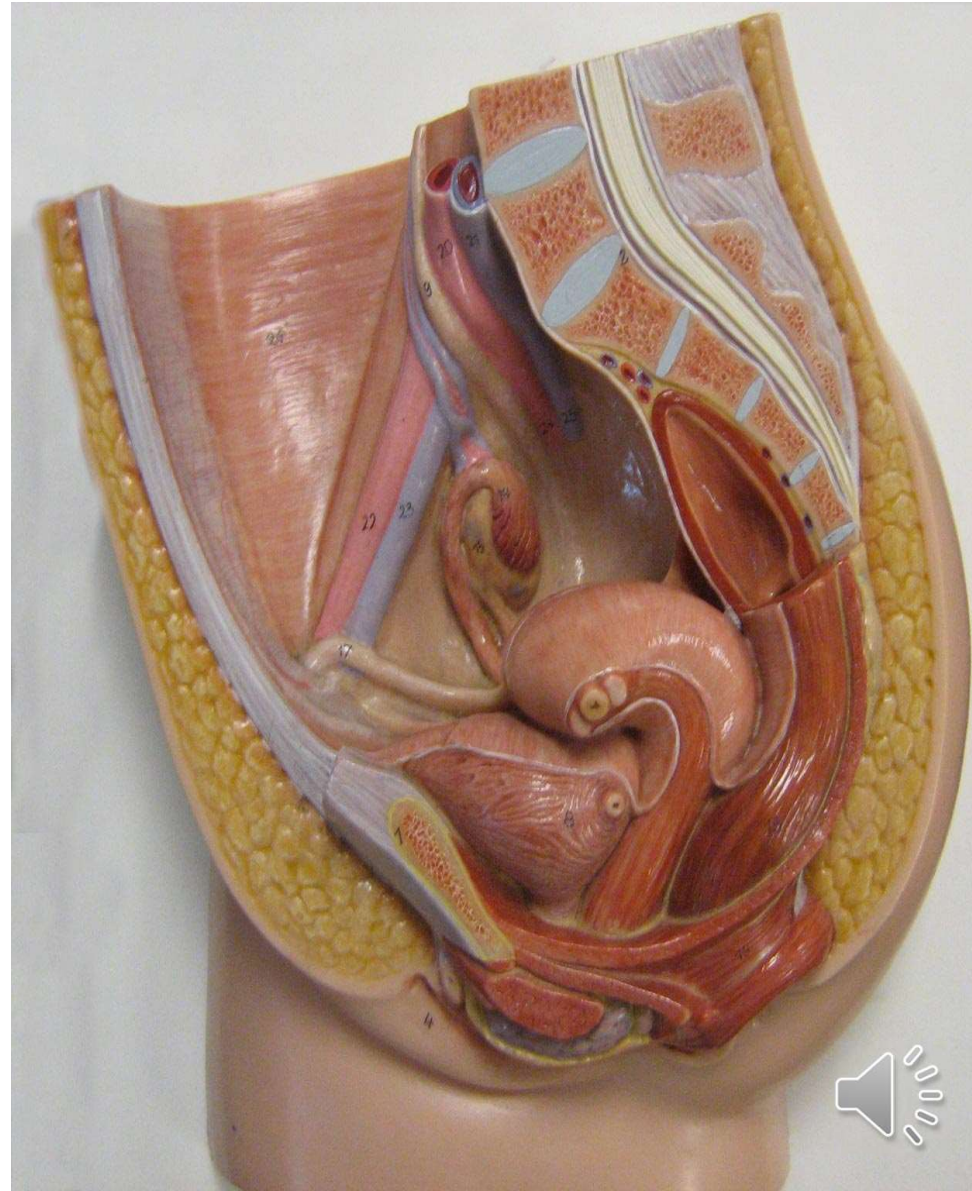
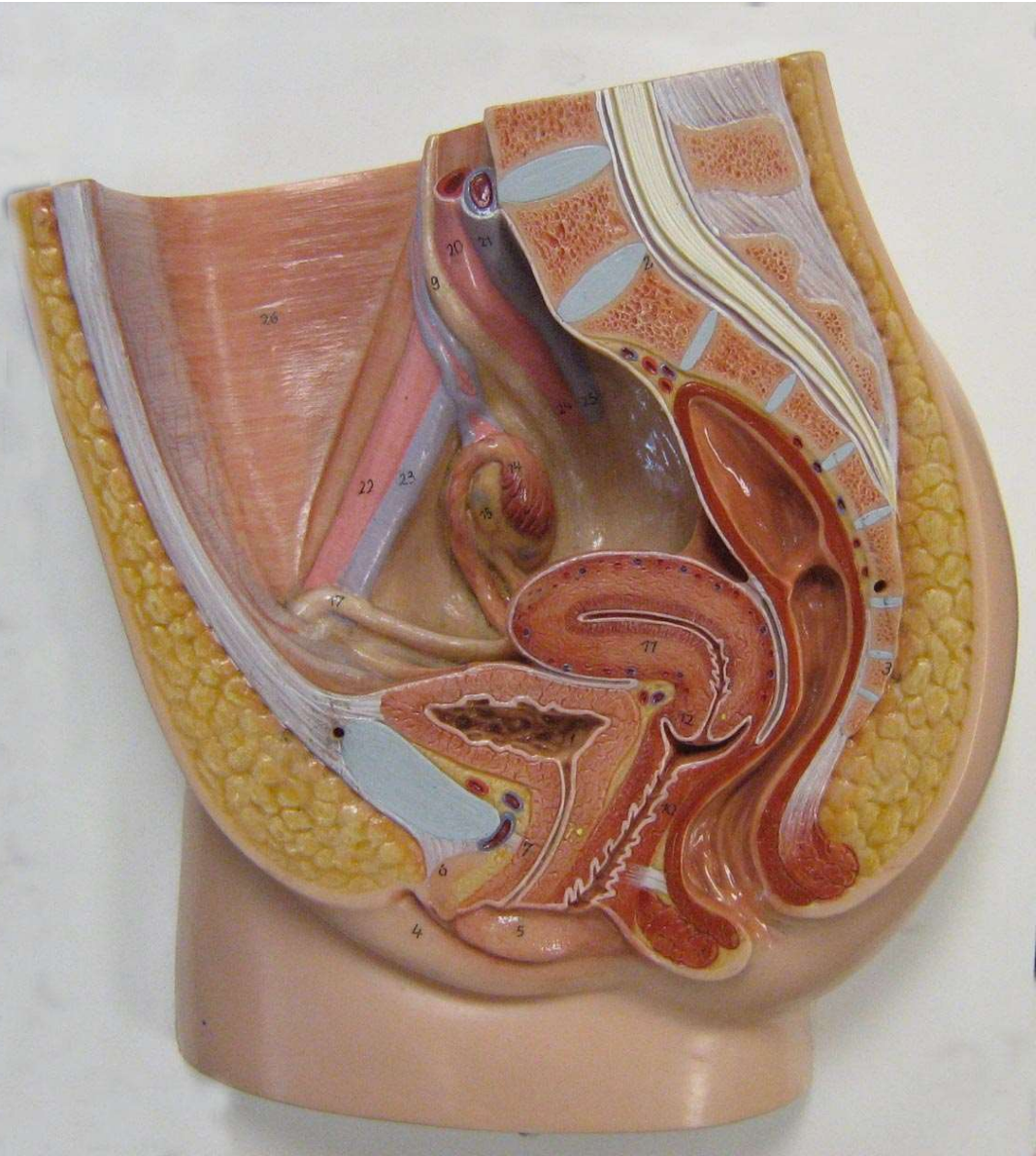
Reproductive organs of the female, deep view

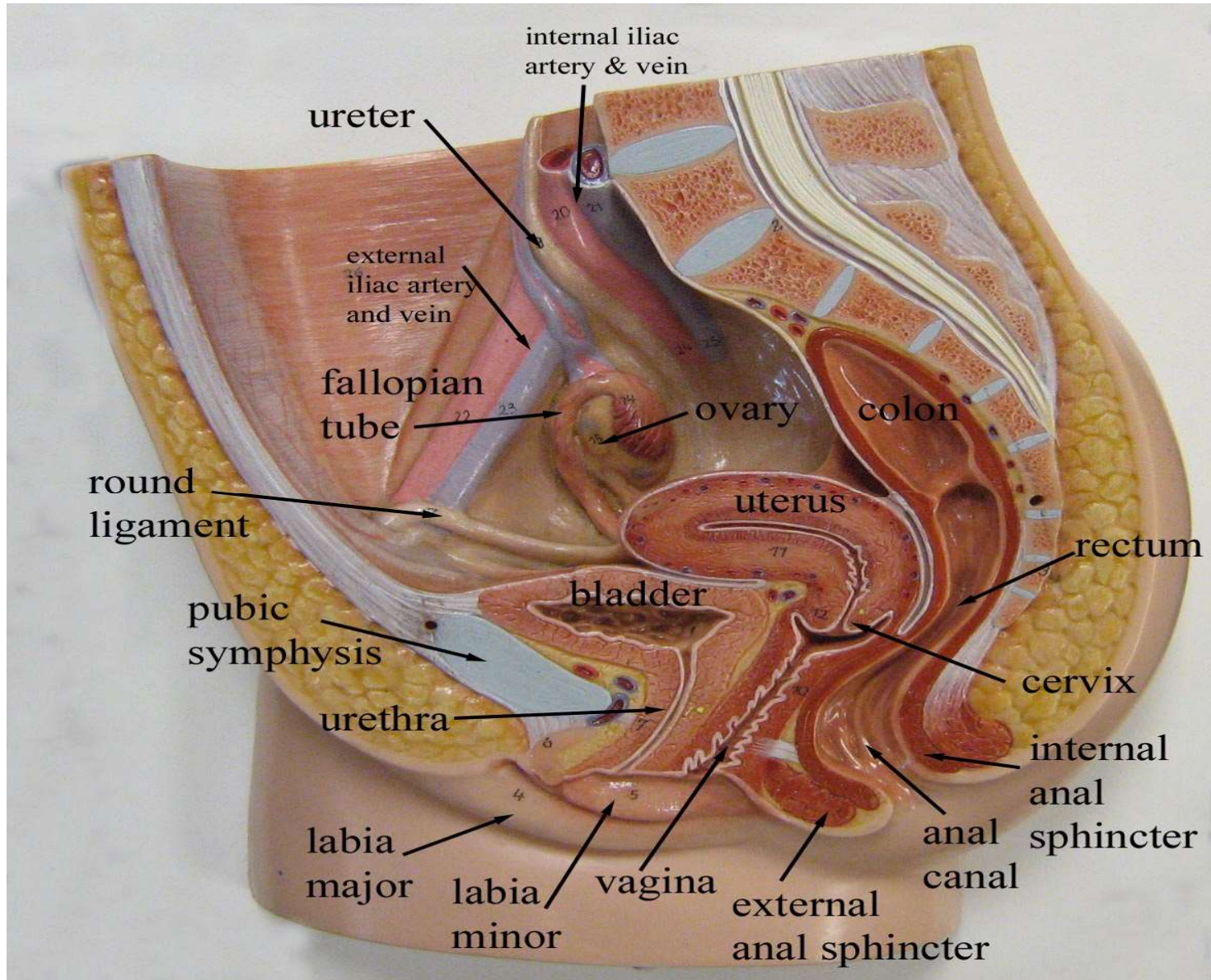


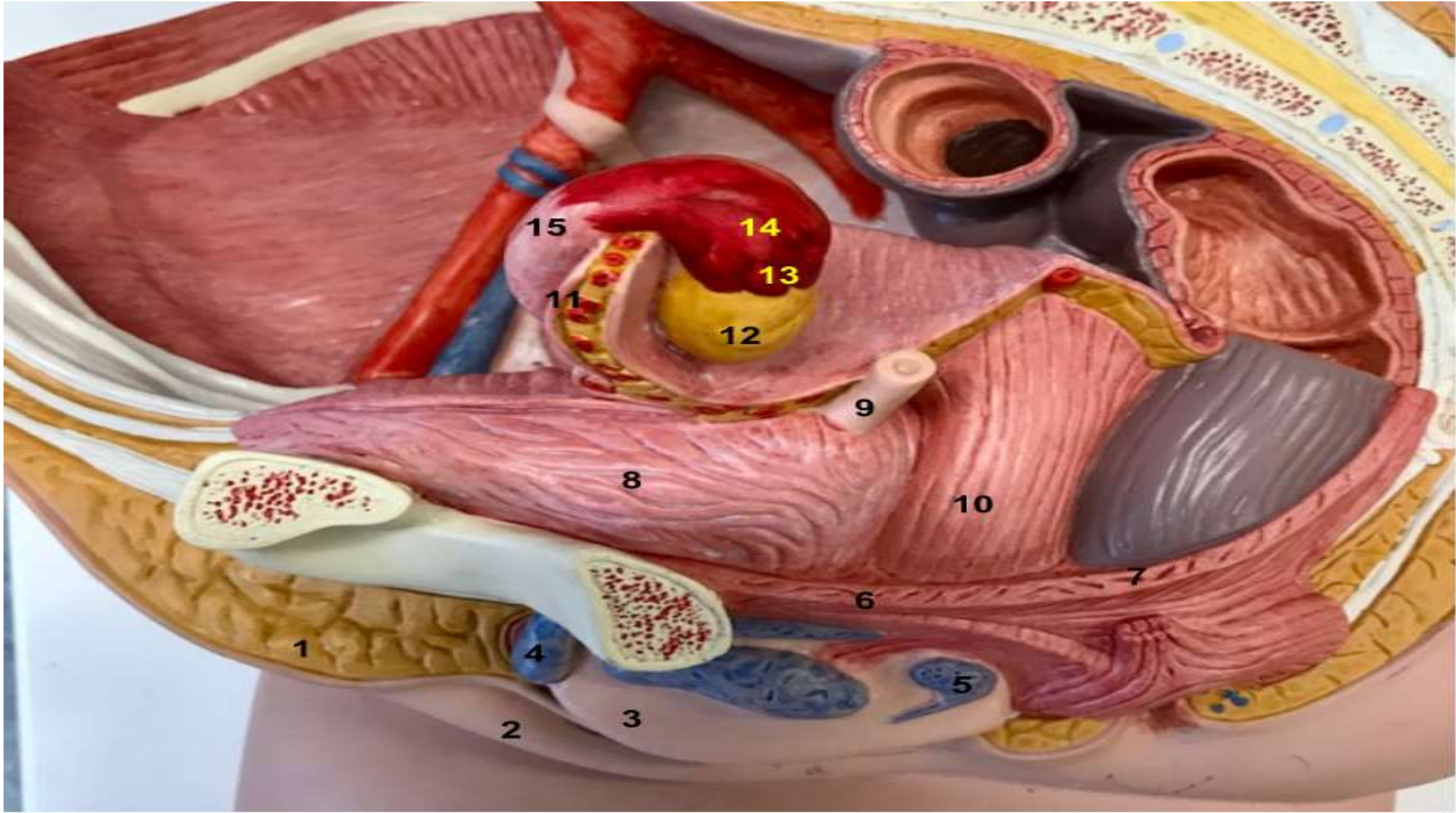
Reproductive organs of the female, deep view

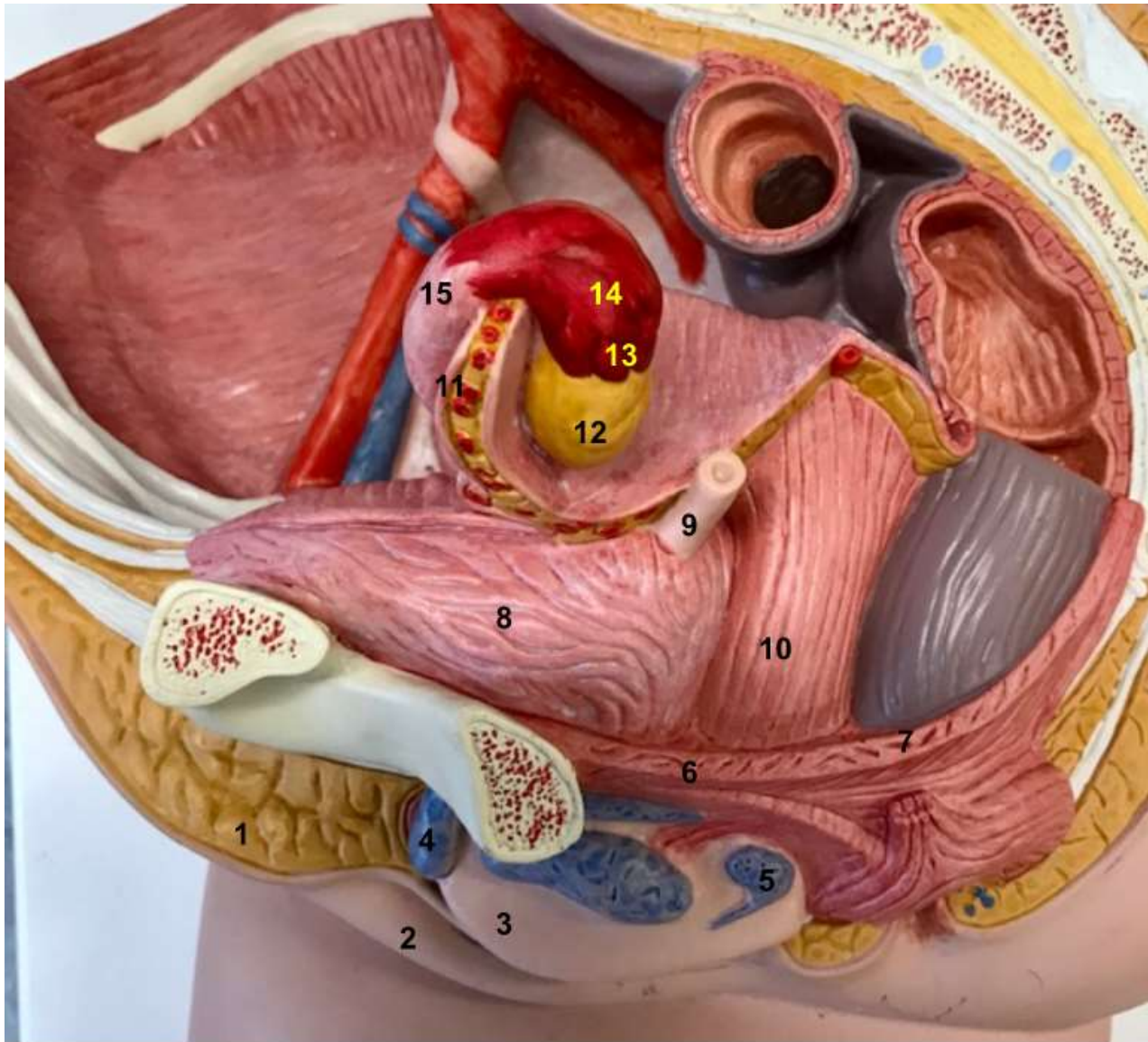


LT-VG386: Female Pelvis, 2-part, 3B Scientific®



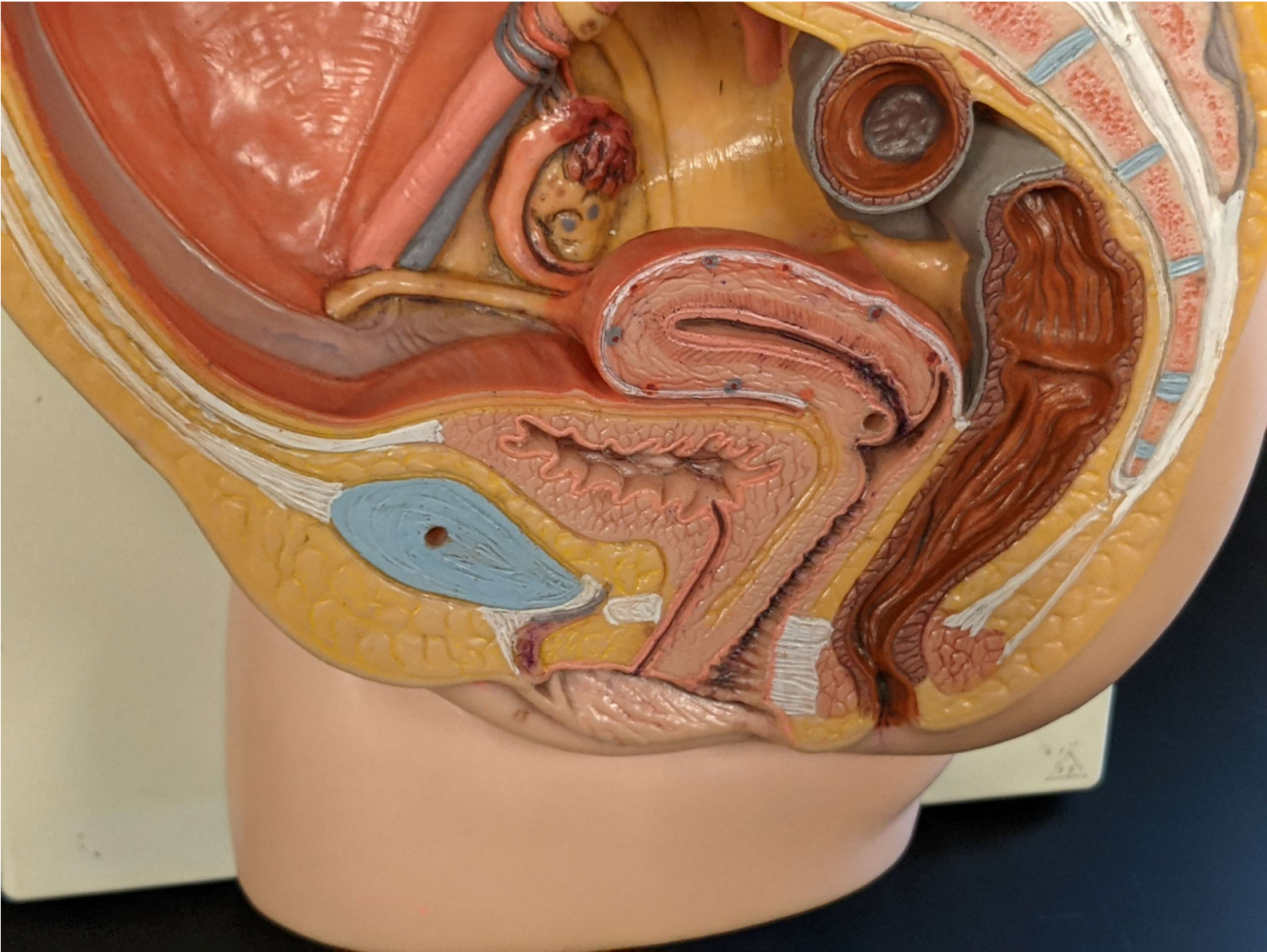






Here we have a model of the female pelvis.

We see the mound of adipose tissue known as the mons pubis (1) just anterior to the pubic symphysis. Extending posteriorly from the mons pubis is a larger fatty fold known as the labium majus (2). It encloses a smaller fold, the labium minus (3). At the anterior end of the labium minus, we see an erectile structure, the clitoris (4). The labia, clitoris, and mons pubis are collectively referred to as the vulva.

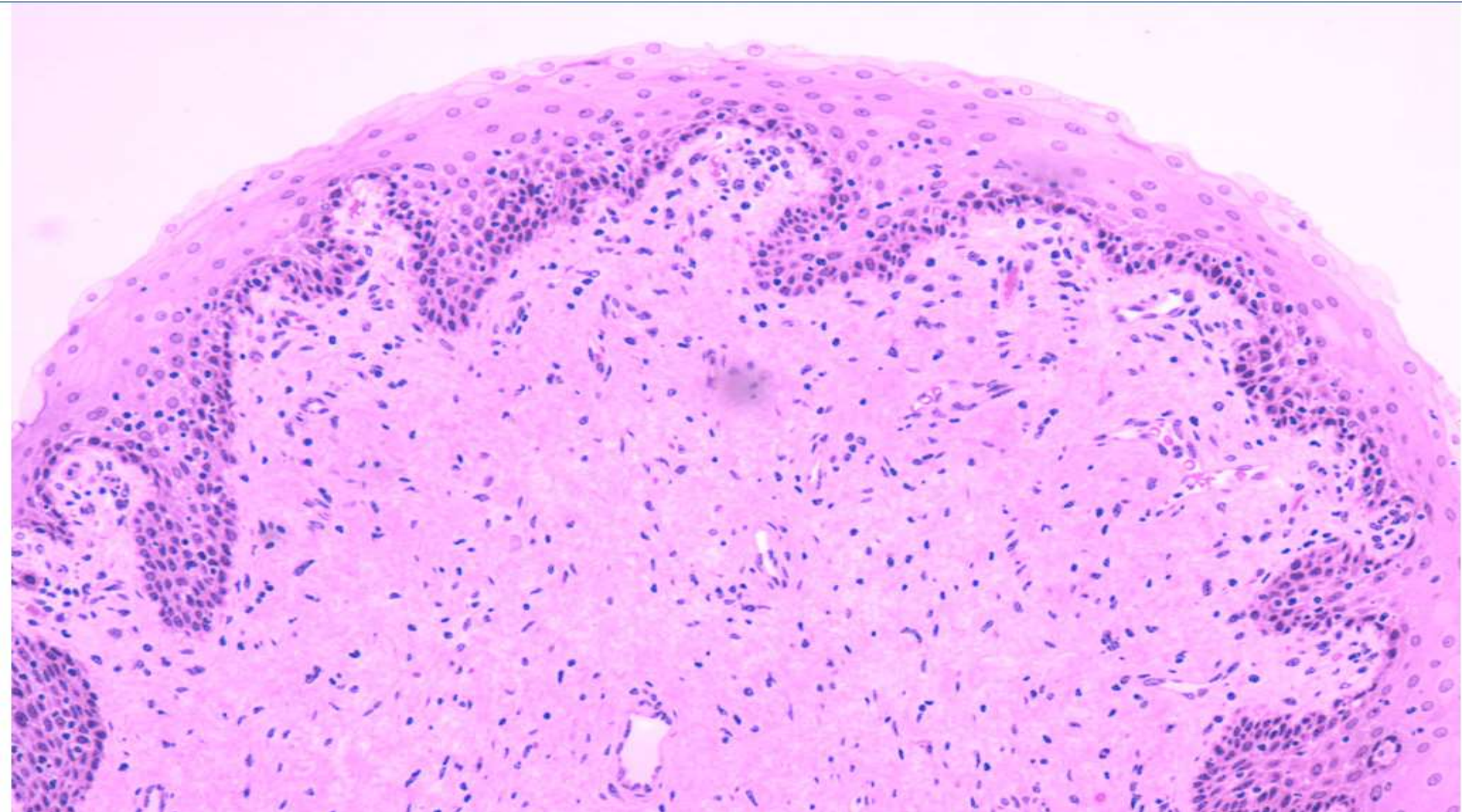


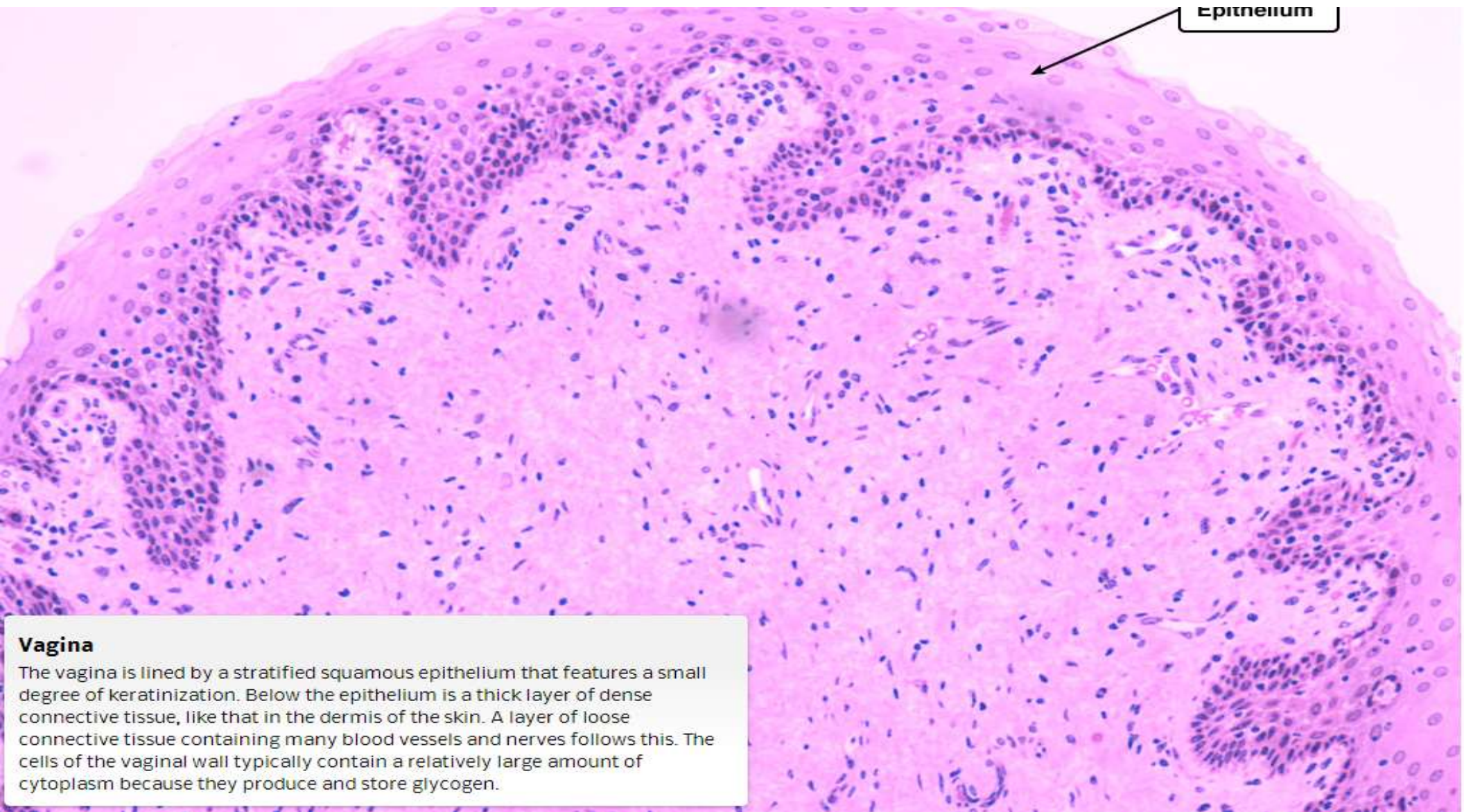






1. Ovary
2. Fallopian tube
3. Fundus of uterus
4. Body of uterus
5. Uterine cavity
6. Internal os
7. Cervical canal
8. Cervix
9. External os
10. Posterior fornix
11. Anterior fornix
12. Vaginal canal
13. External vaginal orifice
14. Labium minus
15. Labium majus
16. Clitoris
17. Mons pubis





Epithelium

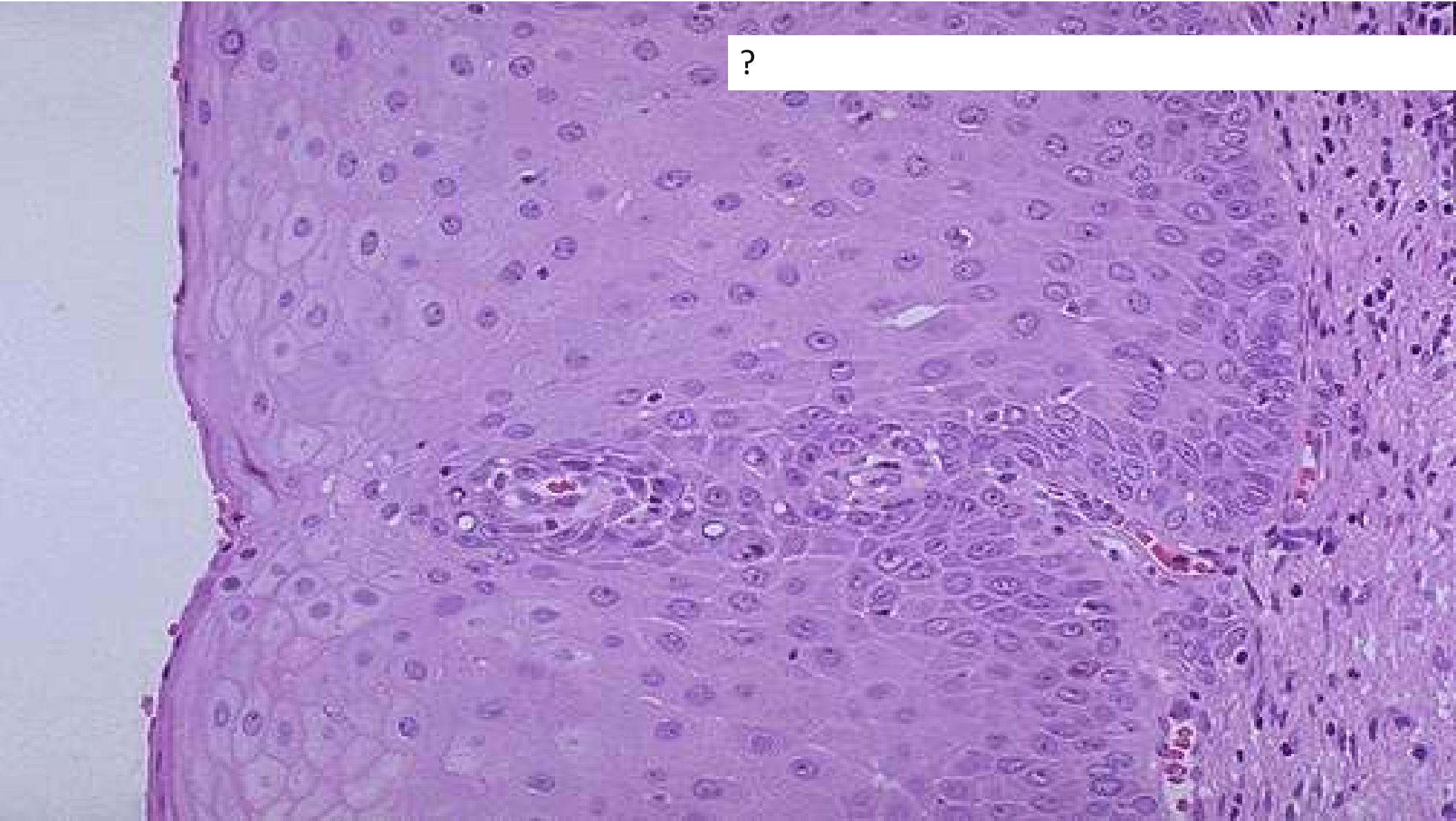
Vagina

The vagina is lined by a stratified squamous epithelium that features a small degree of keratinization. Below the epithelium is a thick layer of dense connective tissue, like that in the dermis of the skin. A layer of loose connective tissue containing many blood vessels and nerves follows this. The cells of the vaginal wall typically contain a relatively large amount of cytoplasm because they produce and store glycogen.



normal cervix with a smooth, glistening mucosal surface.





?

normal cervical non-keratinizing squamous epithelium. The squamous cells show maturation from basal layer to surface.

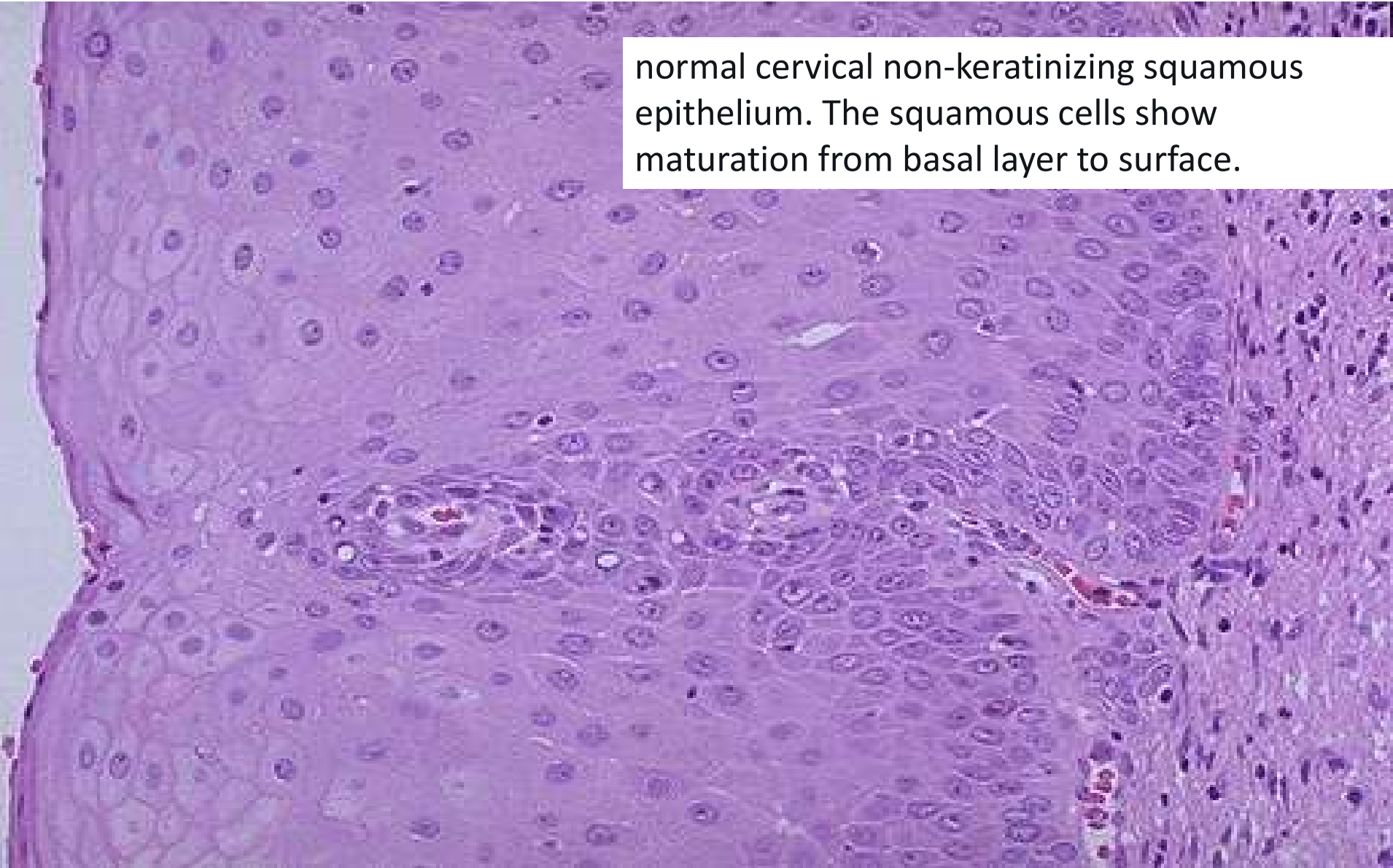
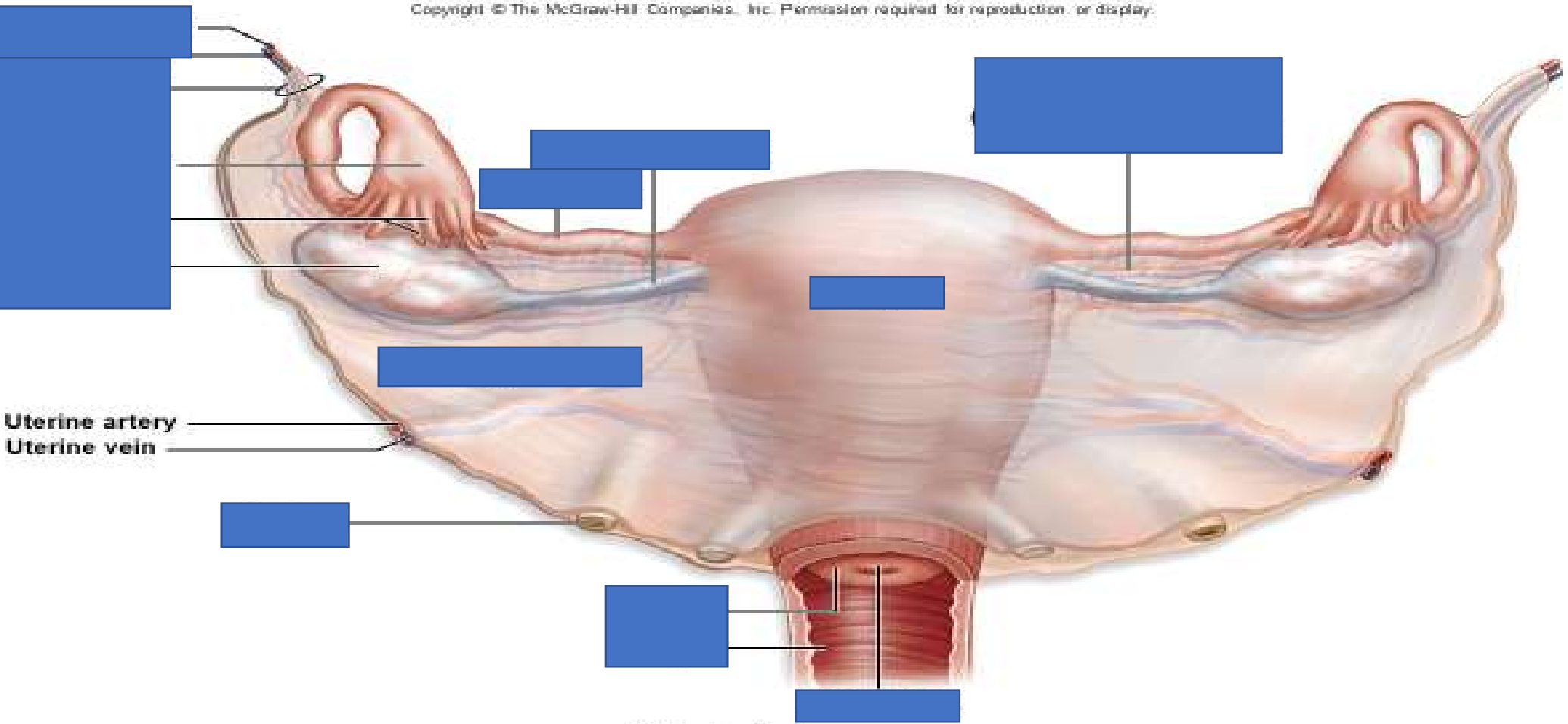


Fig. 28.4a

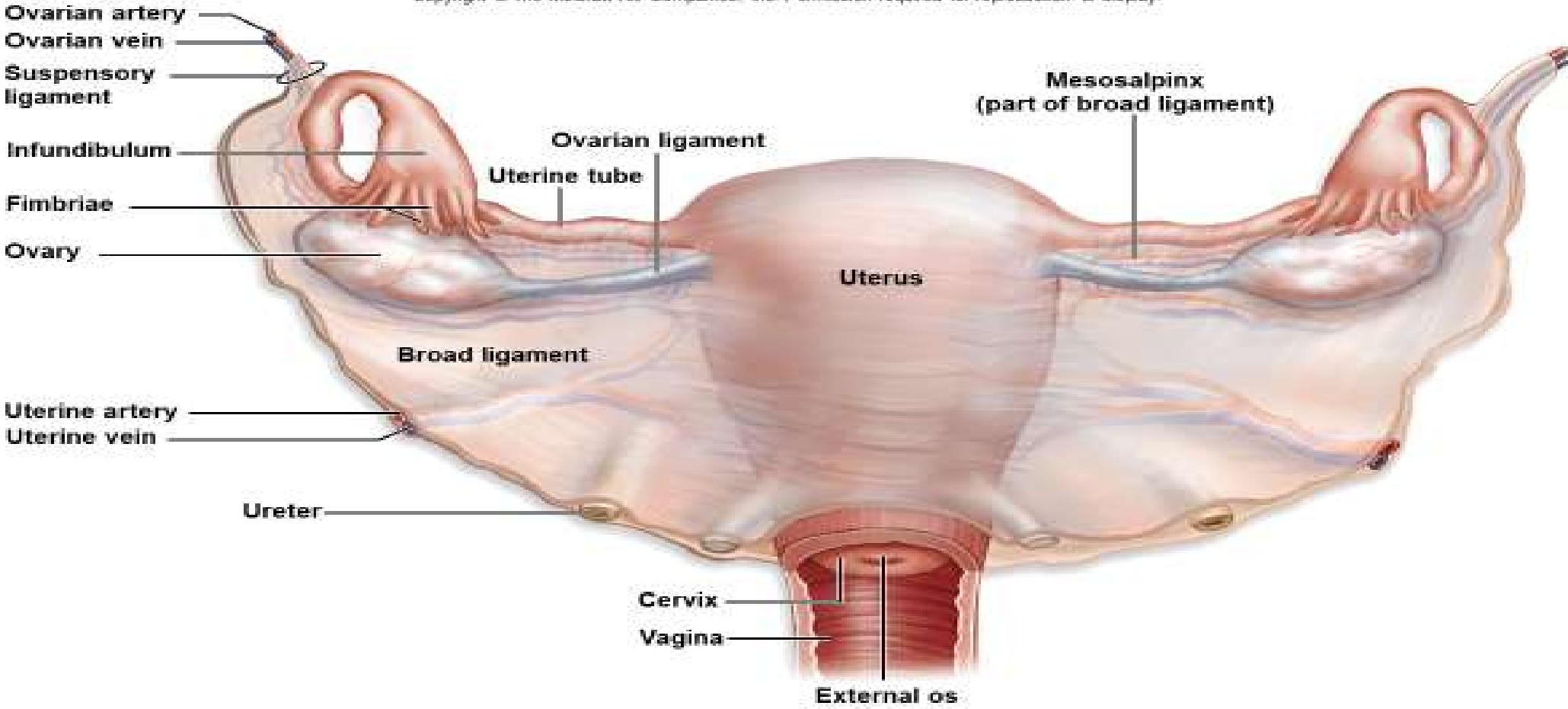
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(a) Posterior view

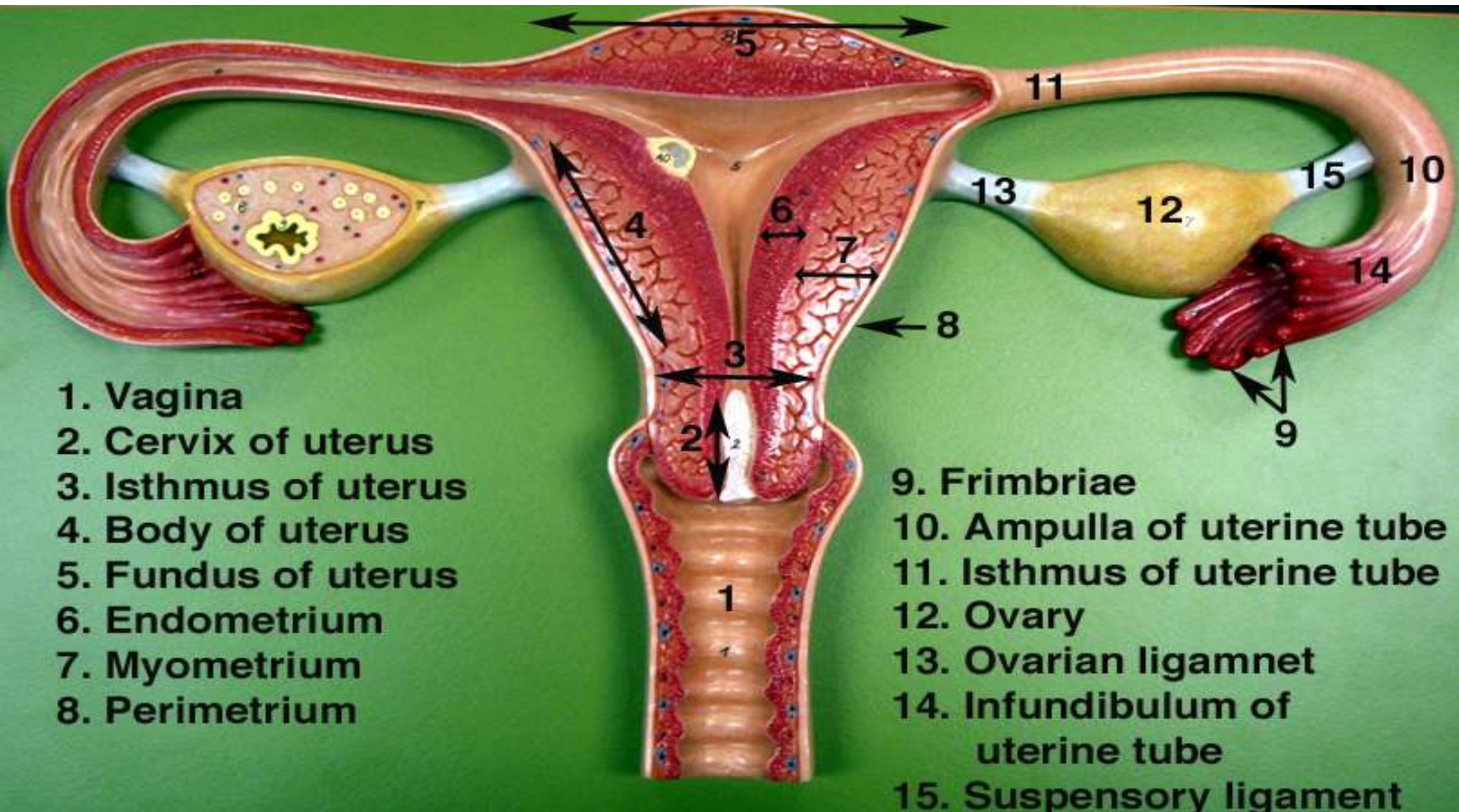
Fig. 28.4a

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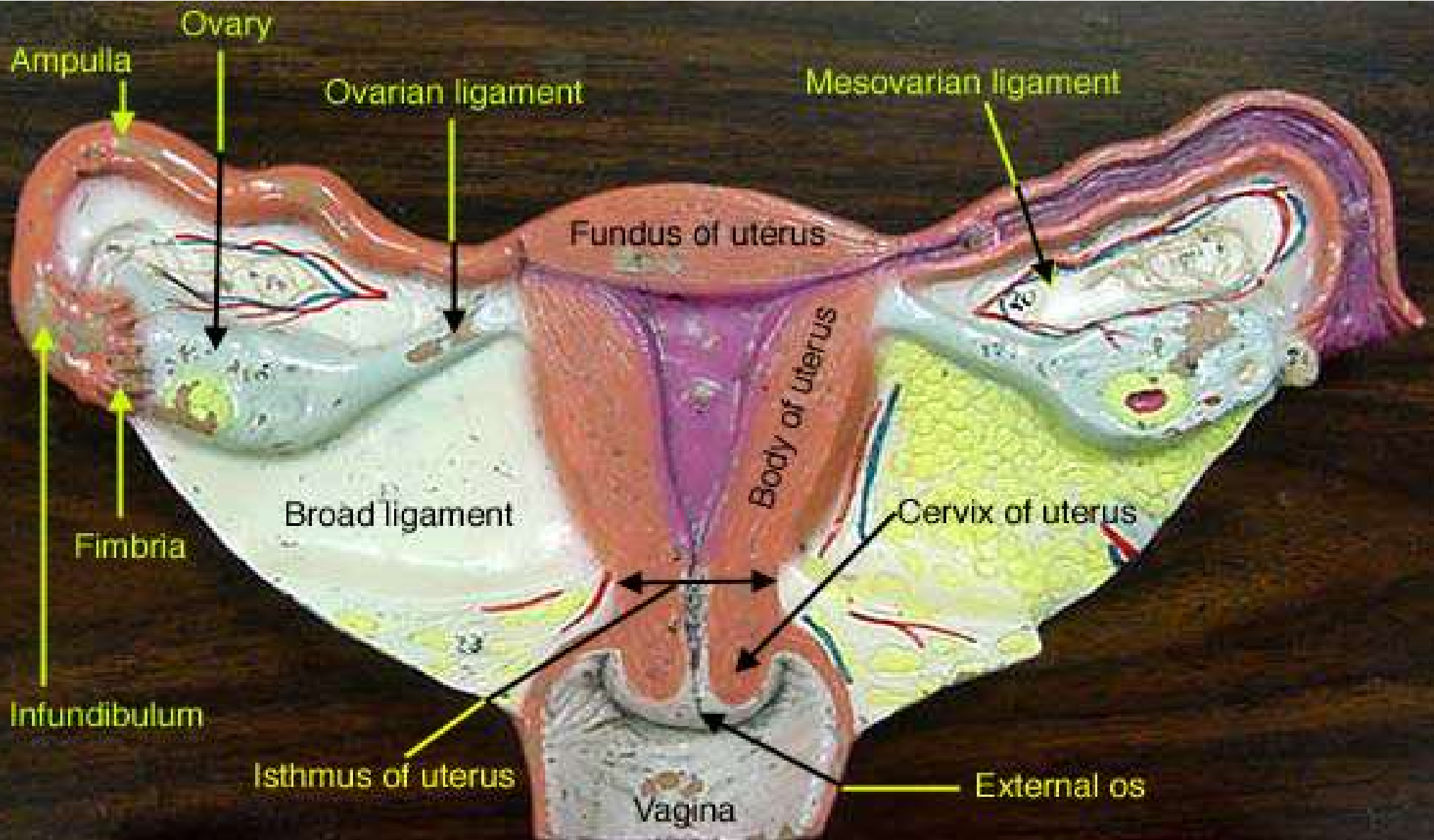


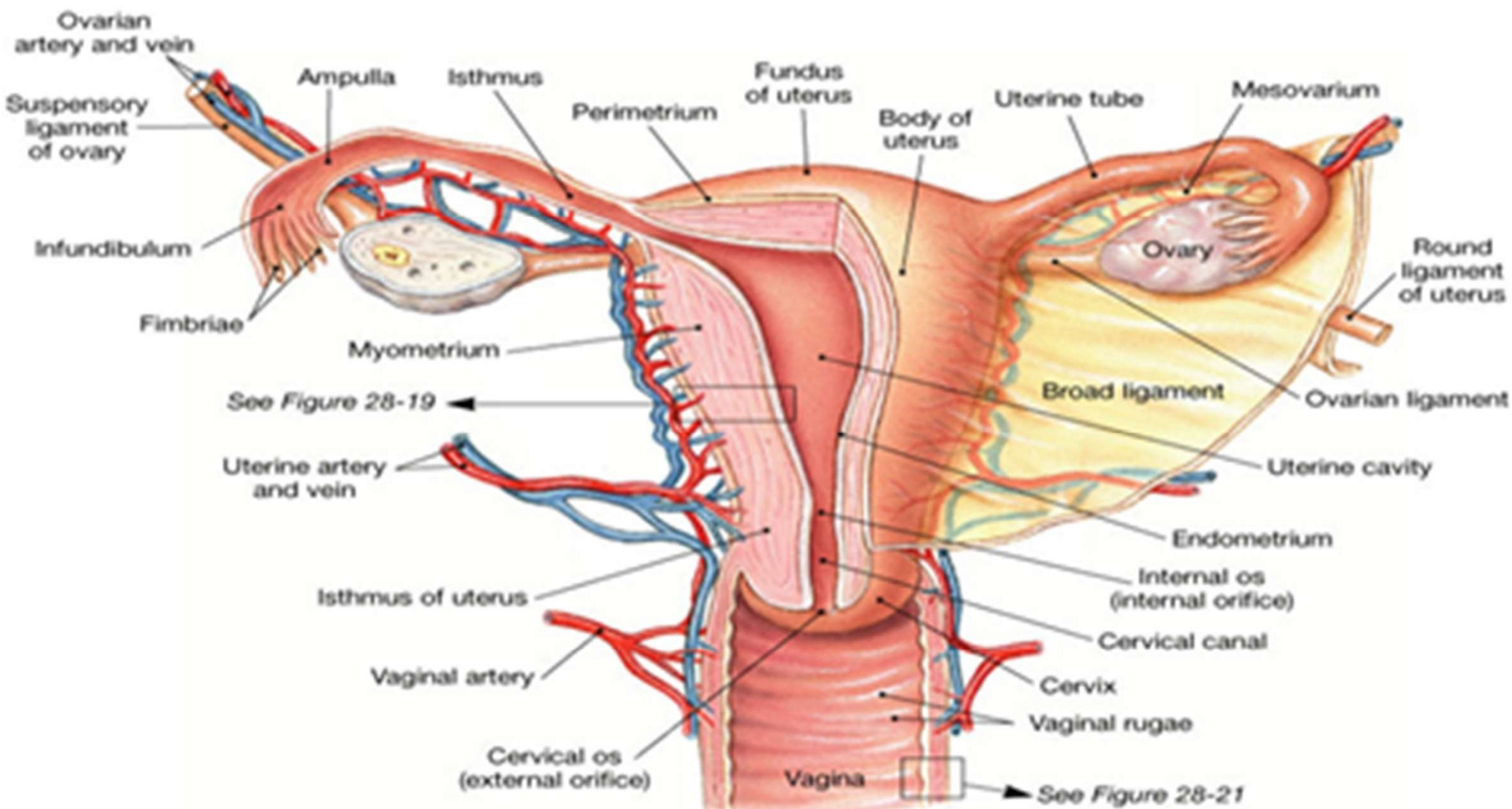
(a) Posterior view



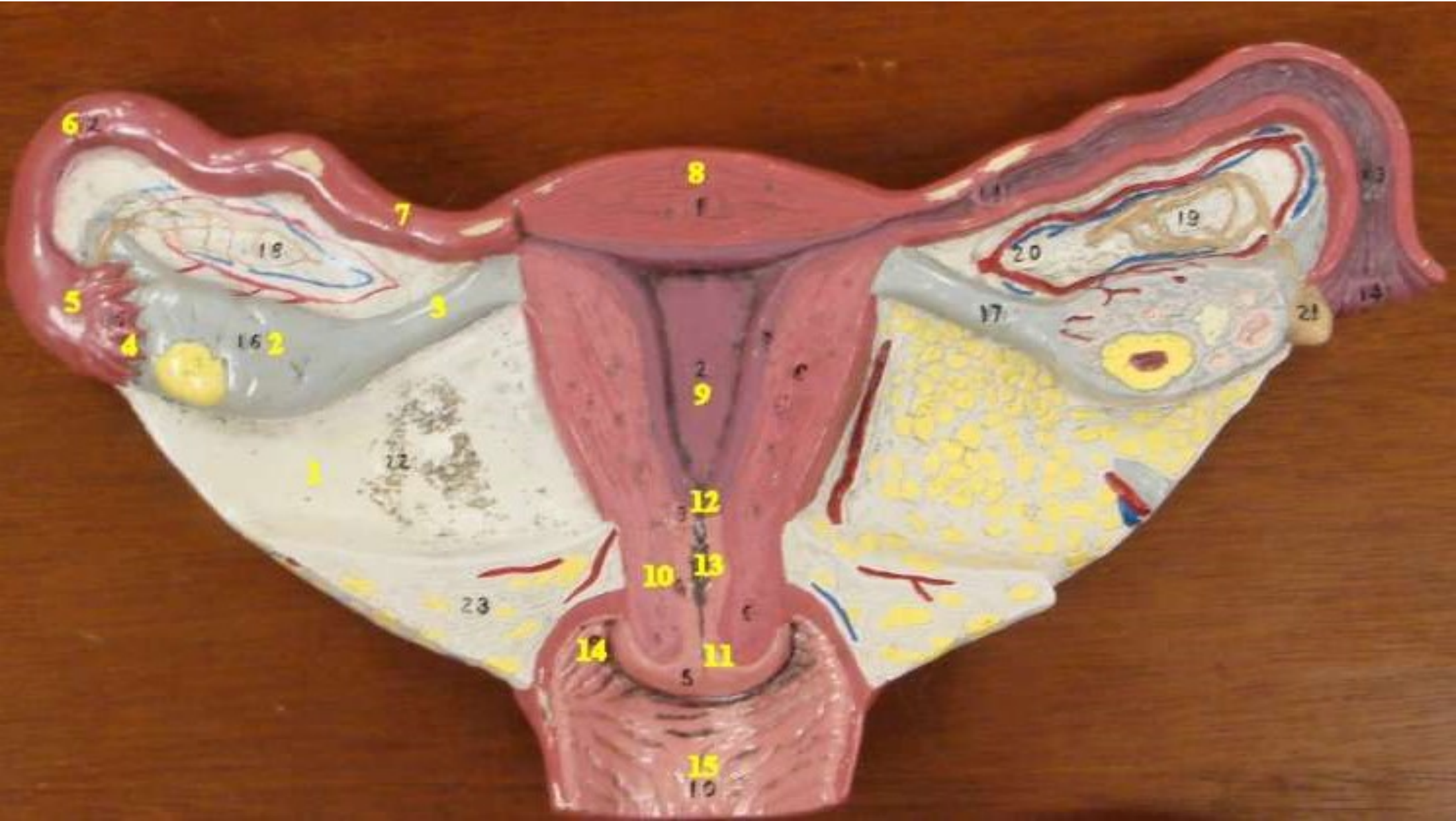


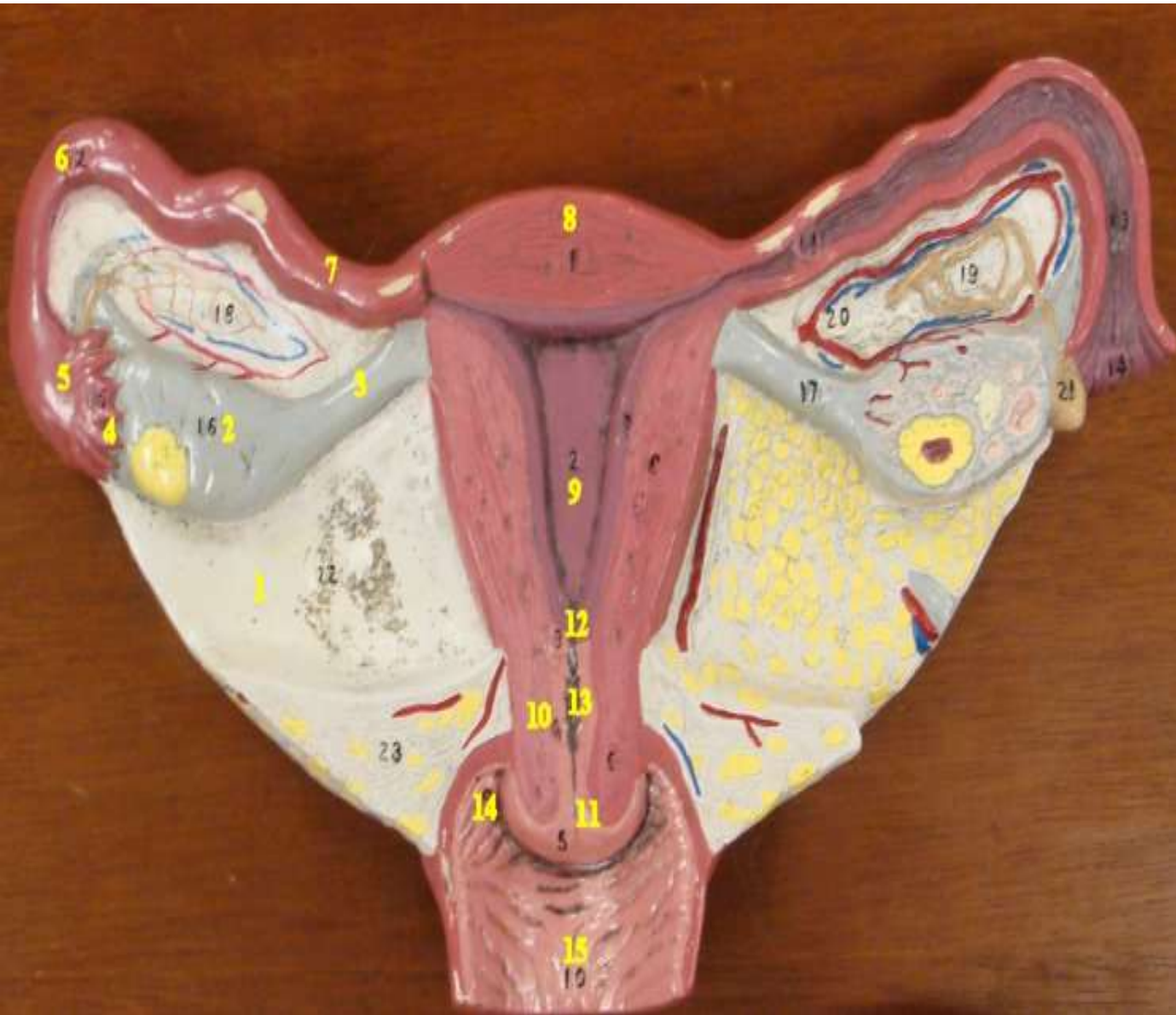




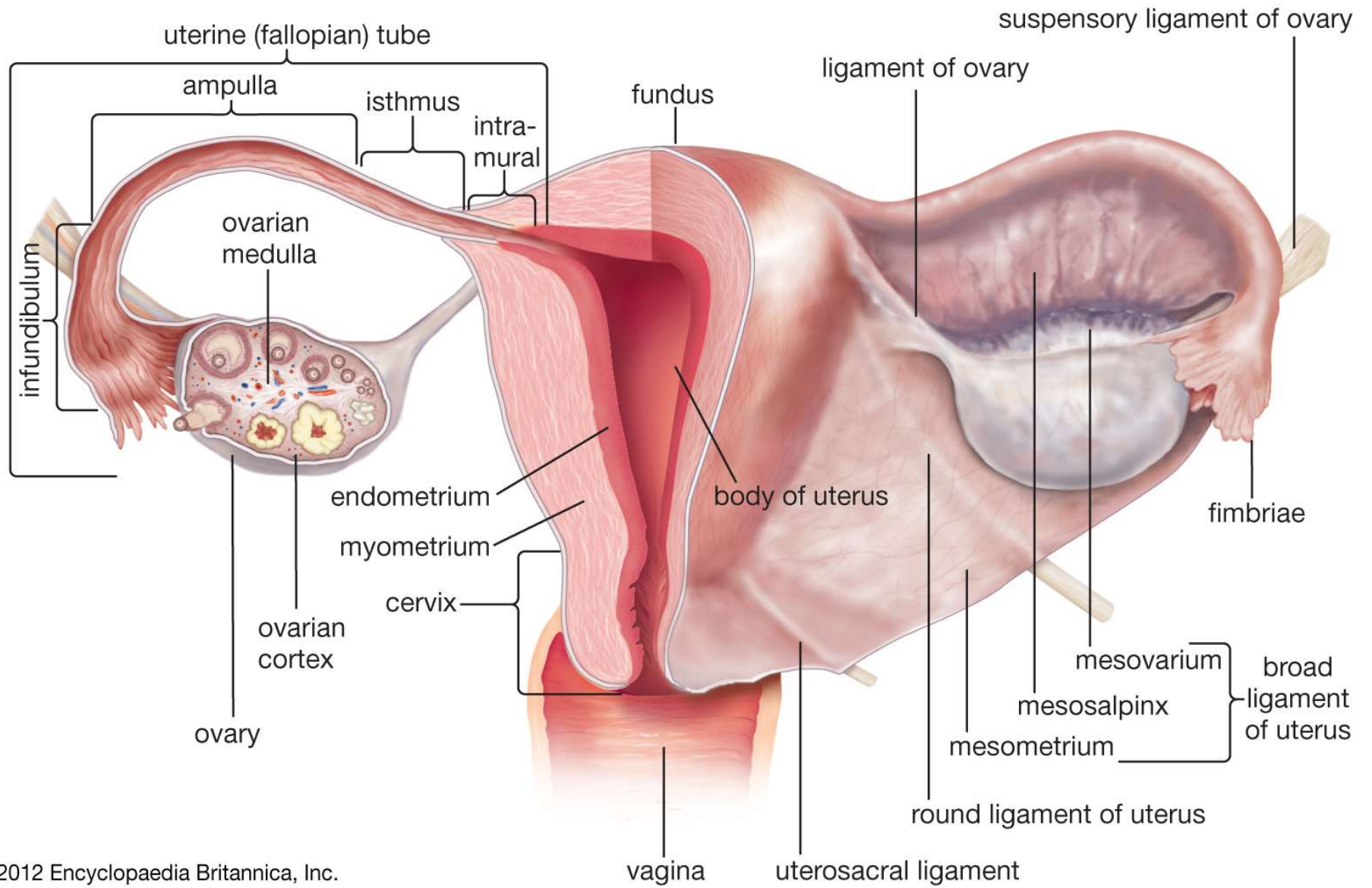


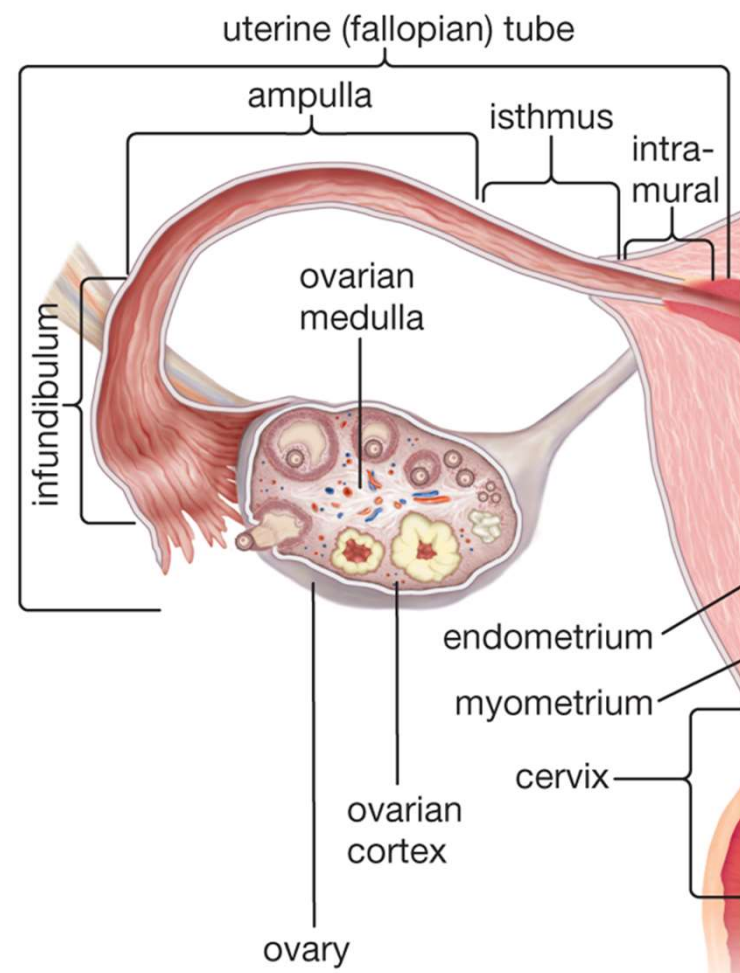
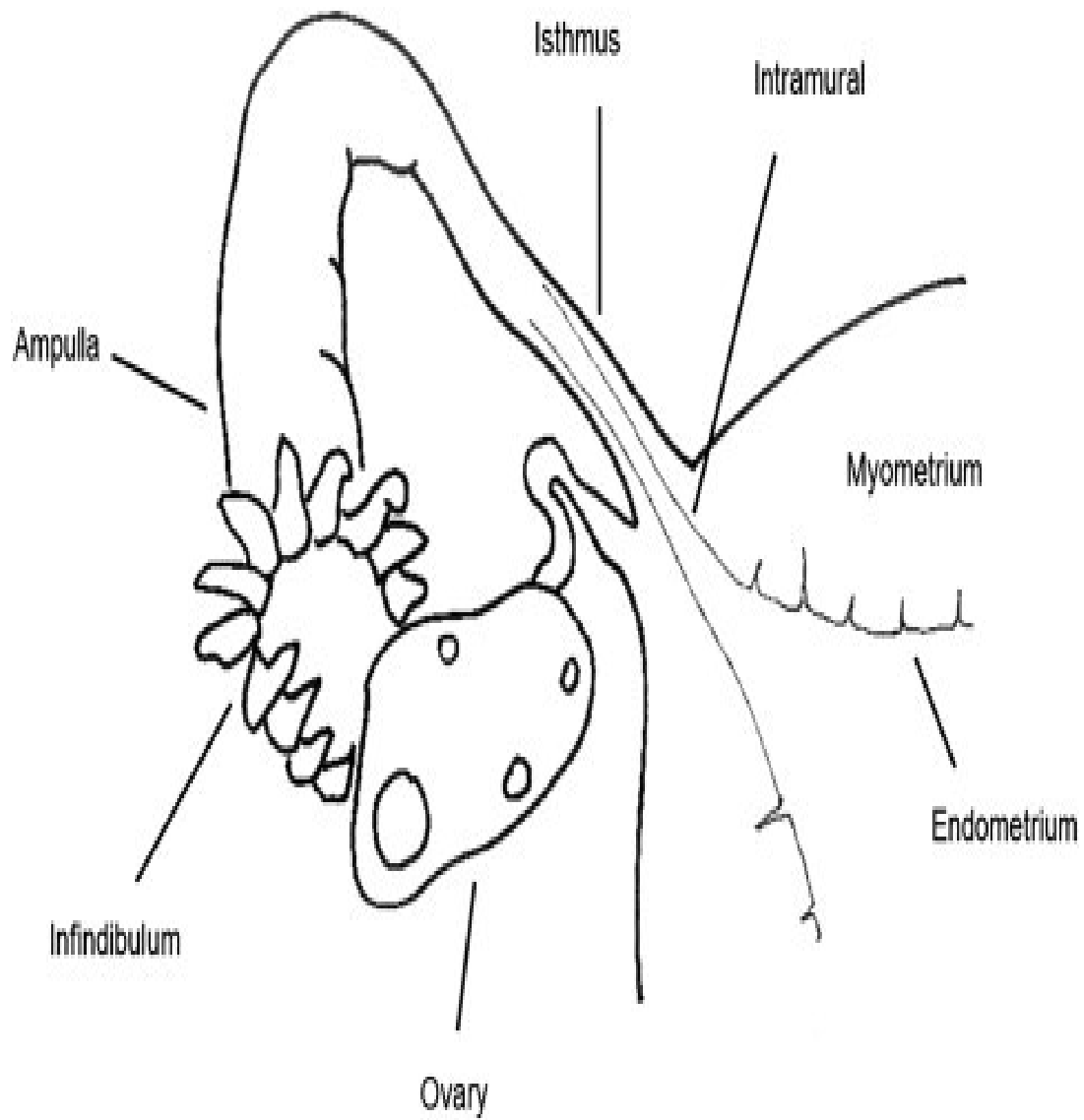
(c) Posterior view

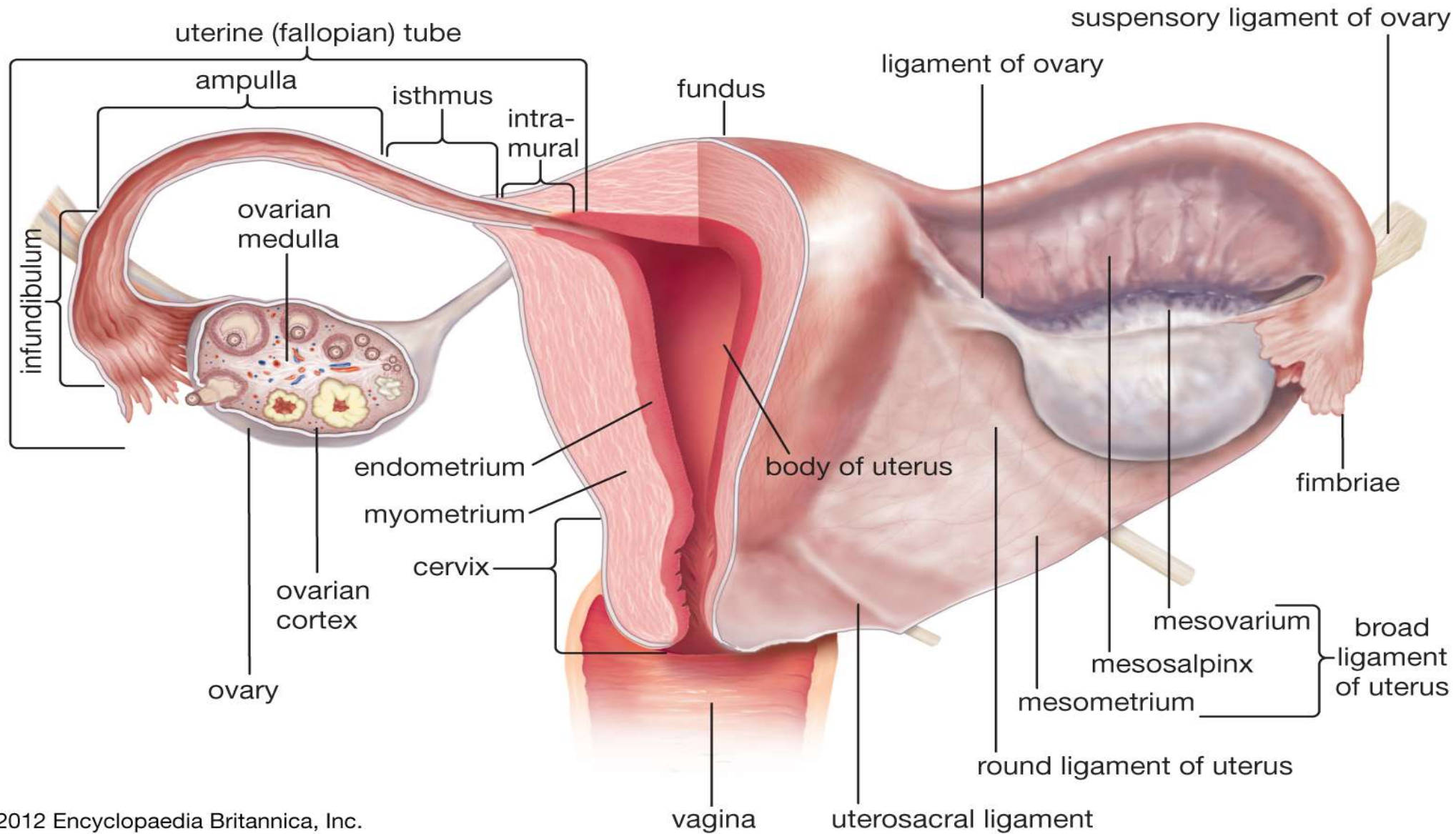


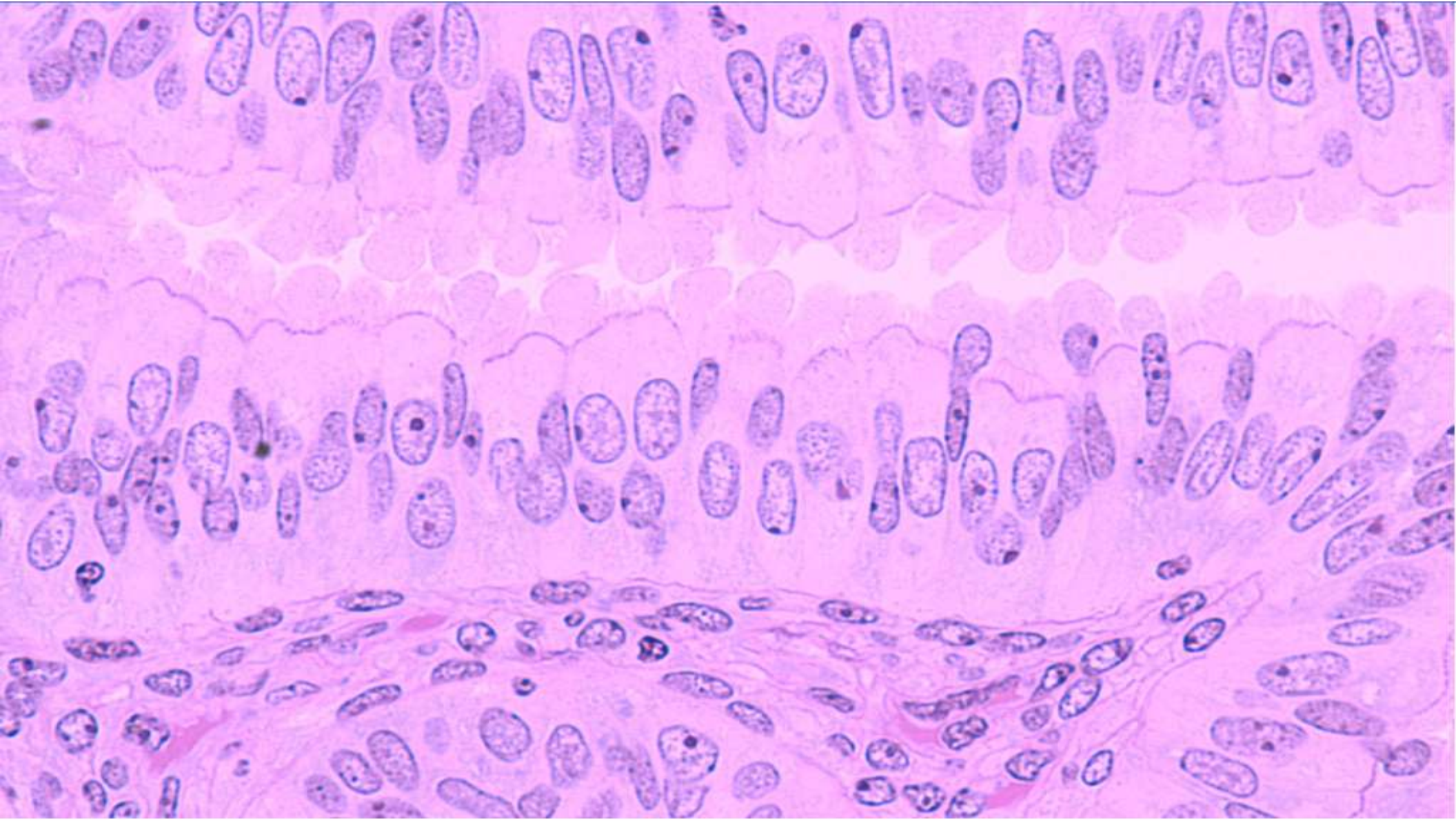


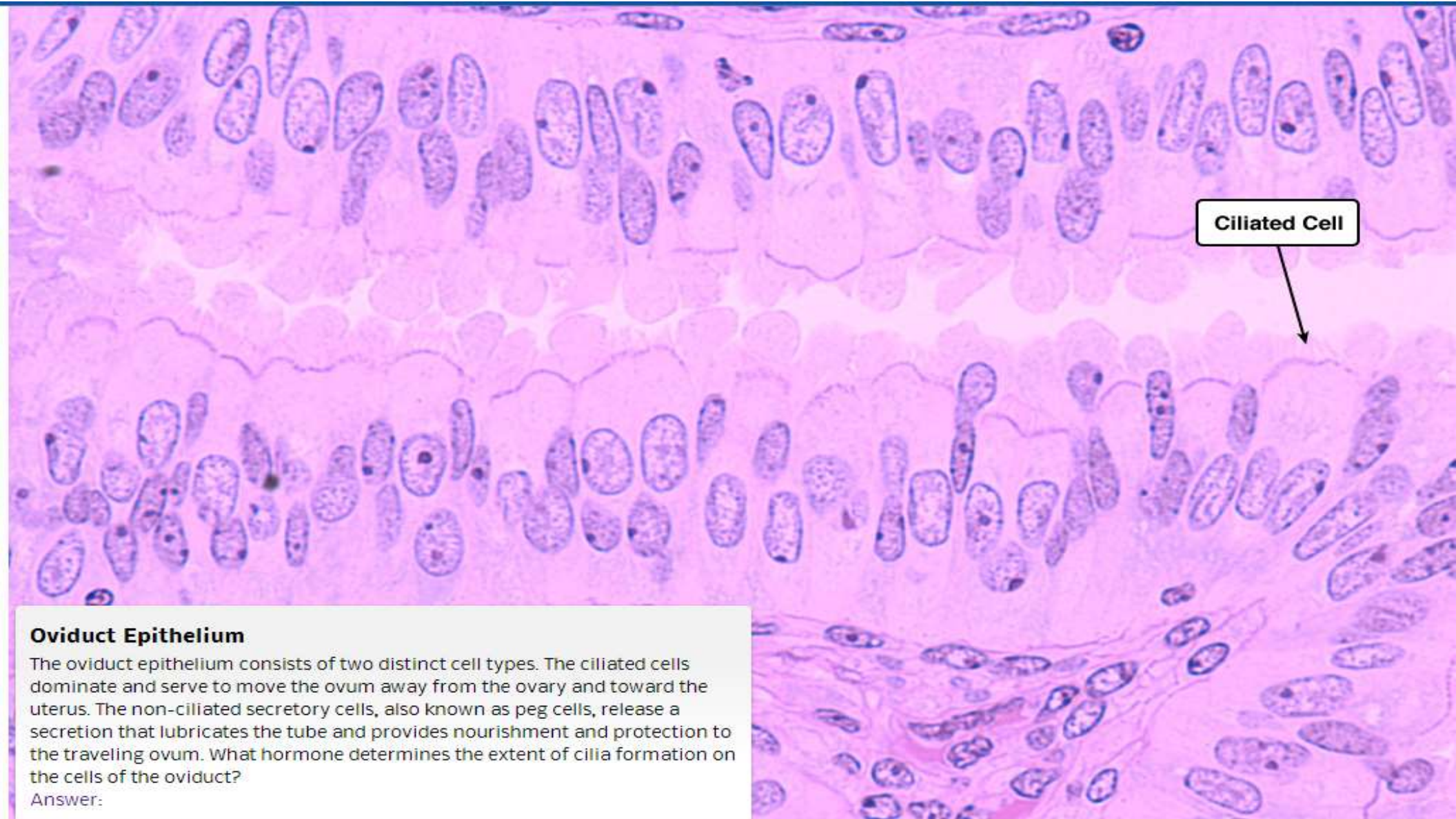
1. Broad ligament
2. Ovary
3. Ovarian ligament
4. Fimbriae
5. Infundibulum
6. Ampulla
7. Isthmus
8. Fundus/Myometrium
9. Body/Stratum functionalis of the endometrium
- 10. Cervix**
11. External os
12. Internal os
13. Cervical canal
14. Lateral fornix
15. Vagina











Ciliated Cell

Oviduct Epithelium

The oviduct epithelium consists of two distinct cell types. The ciliated cells dominate and serve to move the ovum away from the ovary and toward the uterus. The non-ciliated secretory cells, also known as peg cells, release a secretion that lubricates the tube and provides nourishment and protection to the traveling ovum. What hormone determines the extent of cilia formation on the cells of the oviduct?

Answer:

76/Identify 1

A/FALCIFORM LIGAMENT

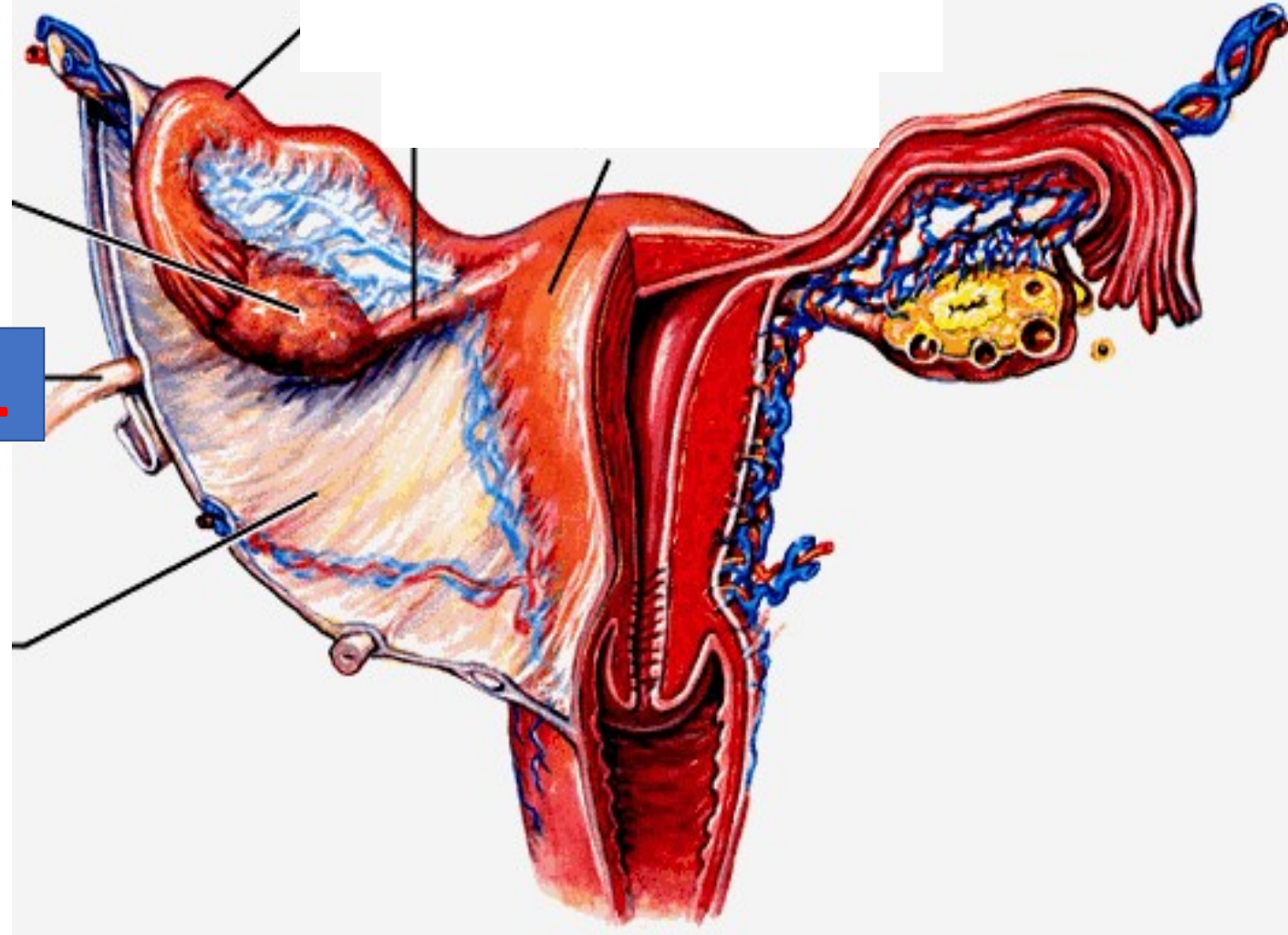
B/TERES LIGAMENT

C/ROUND LIGAMENT

D/SUSPENSOR LIGAMENT

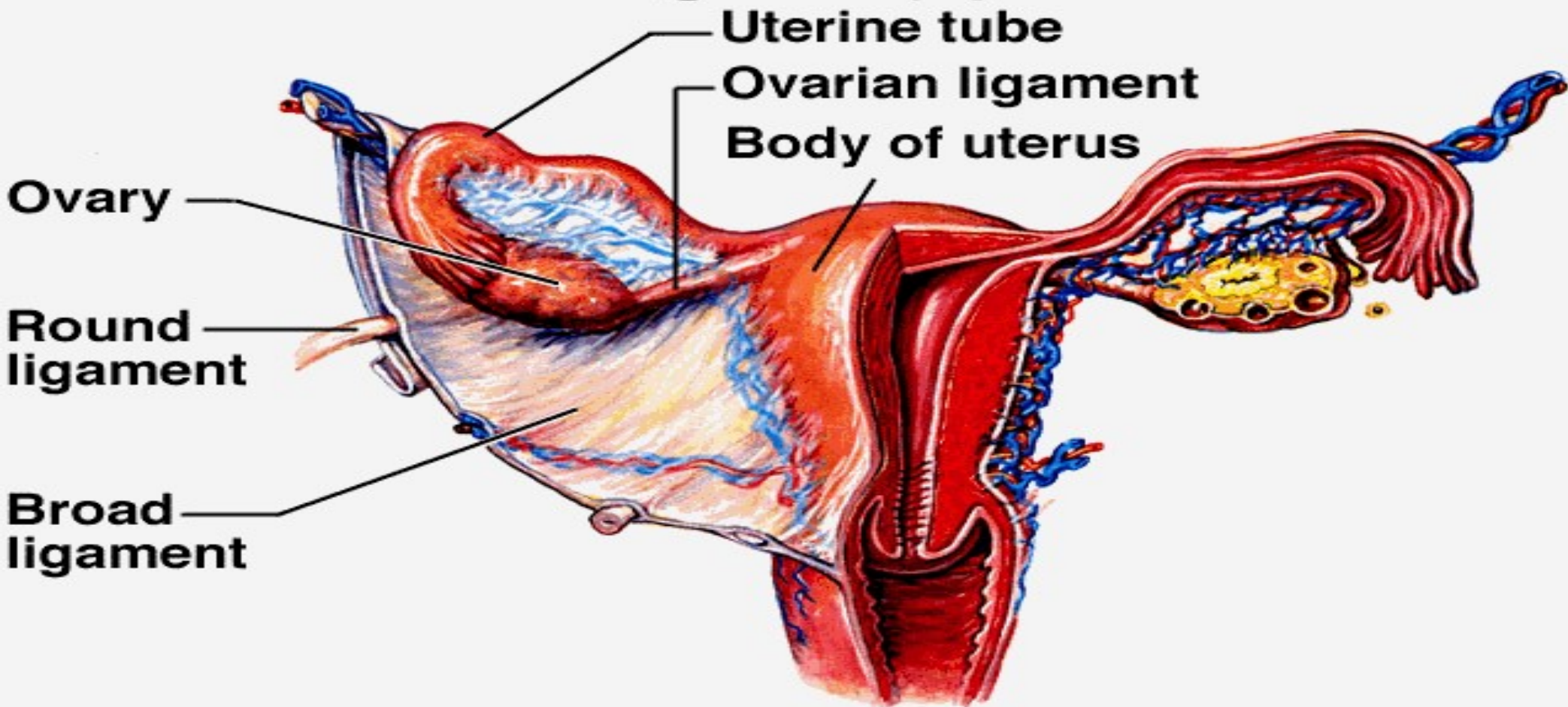
E/SALPINX

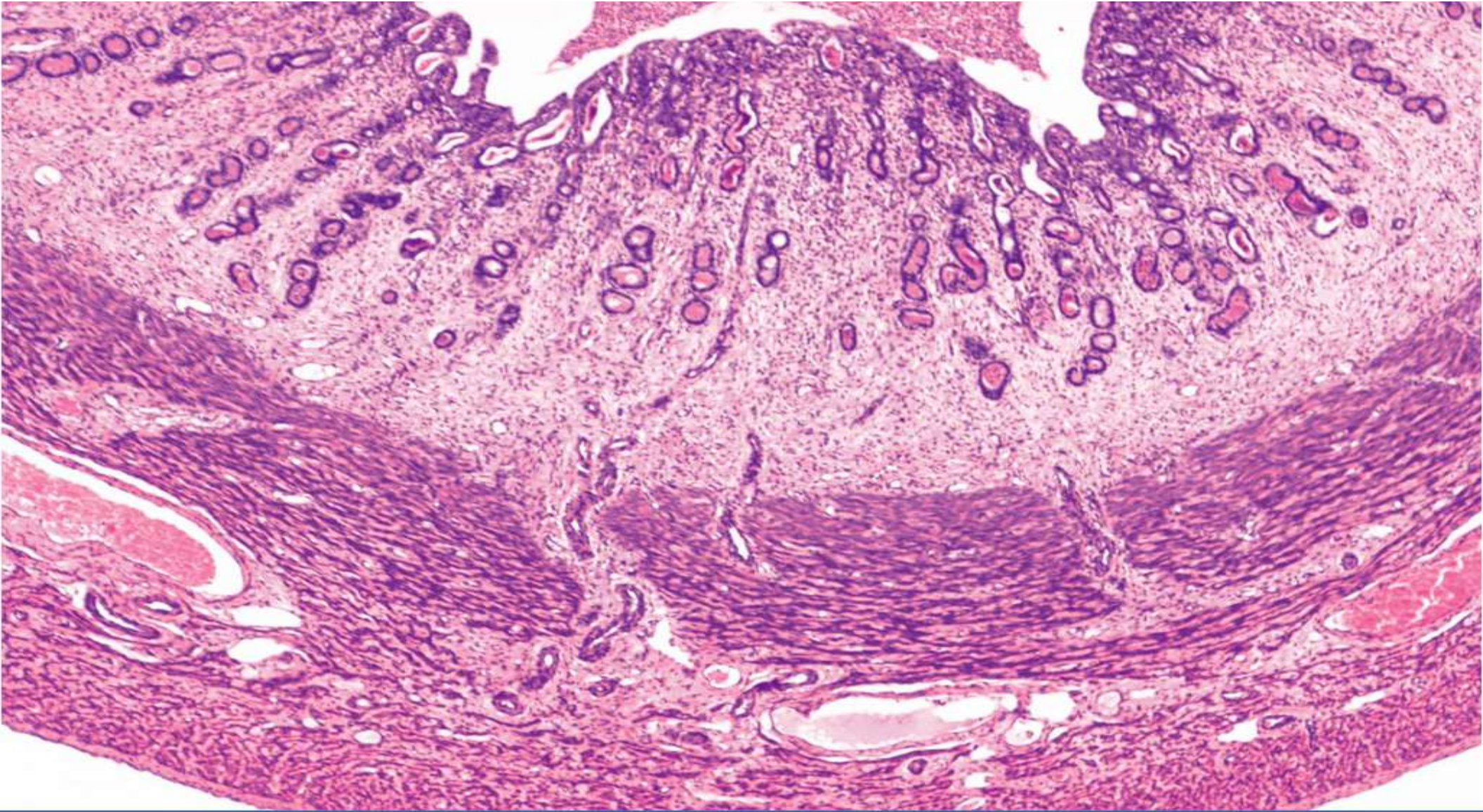
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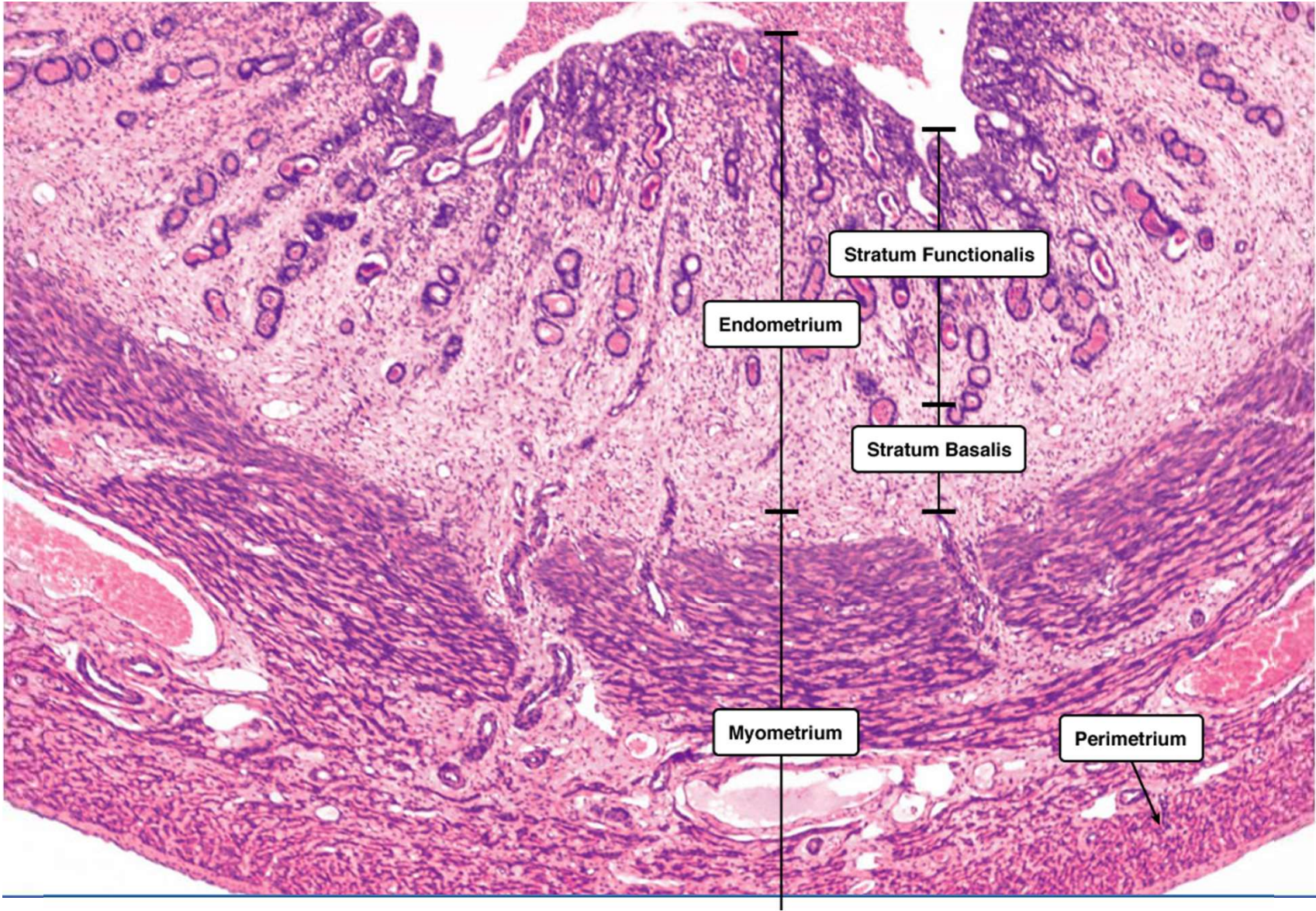


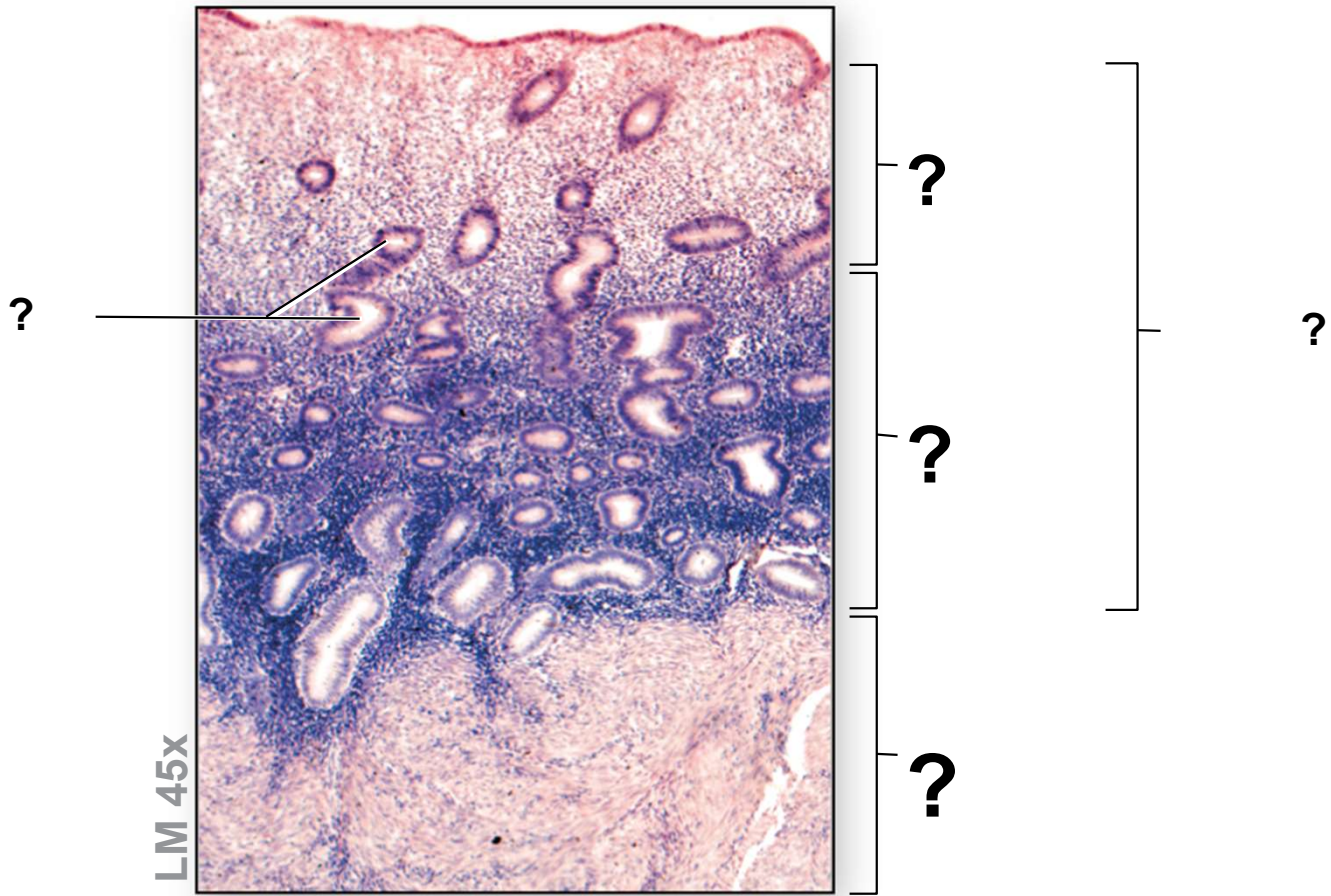
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Female Internal Reproductive Organs (1)



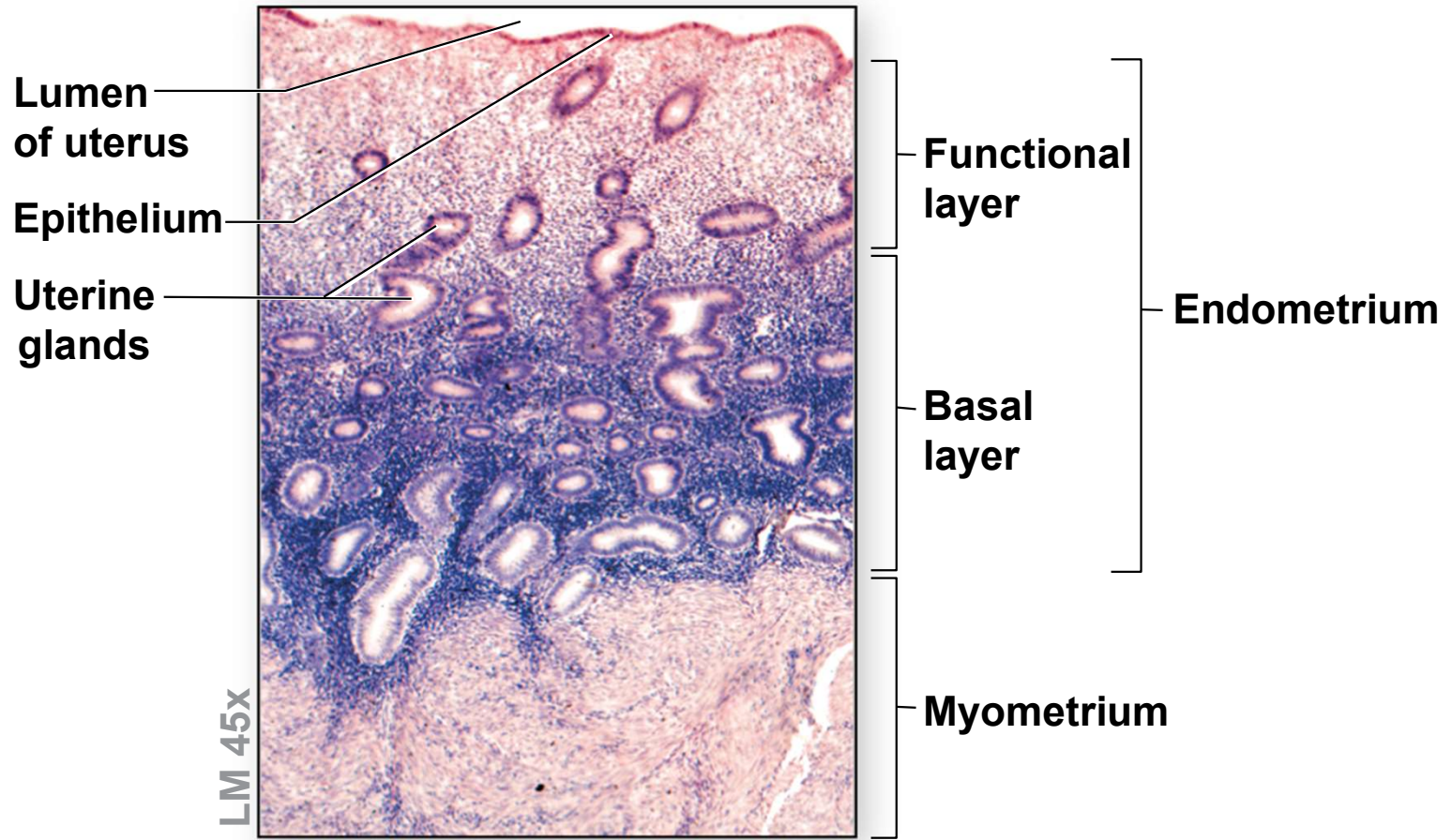




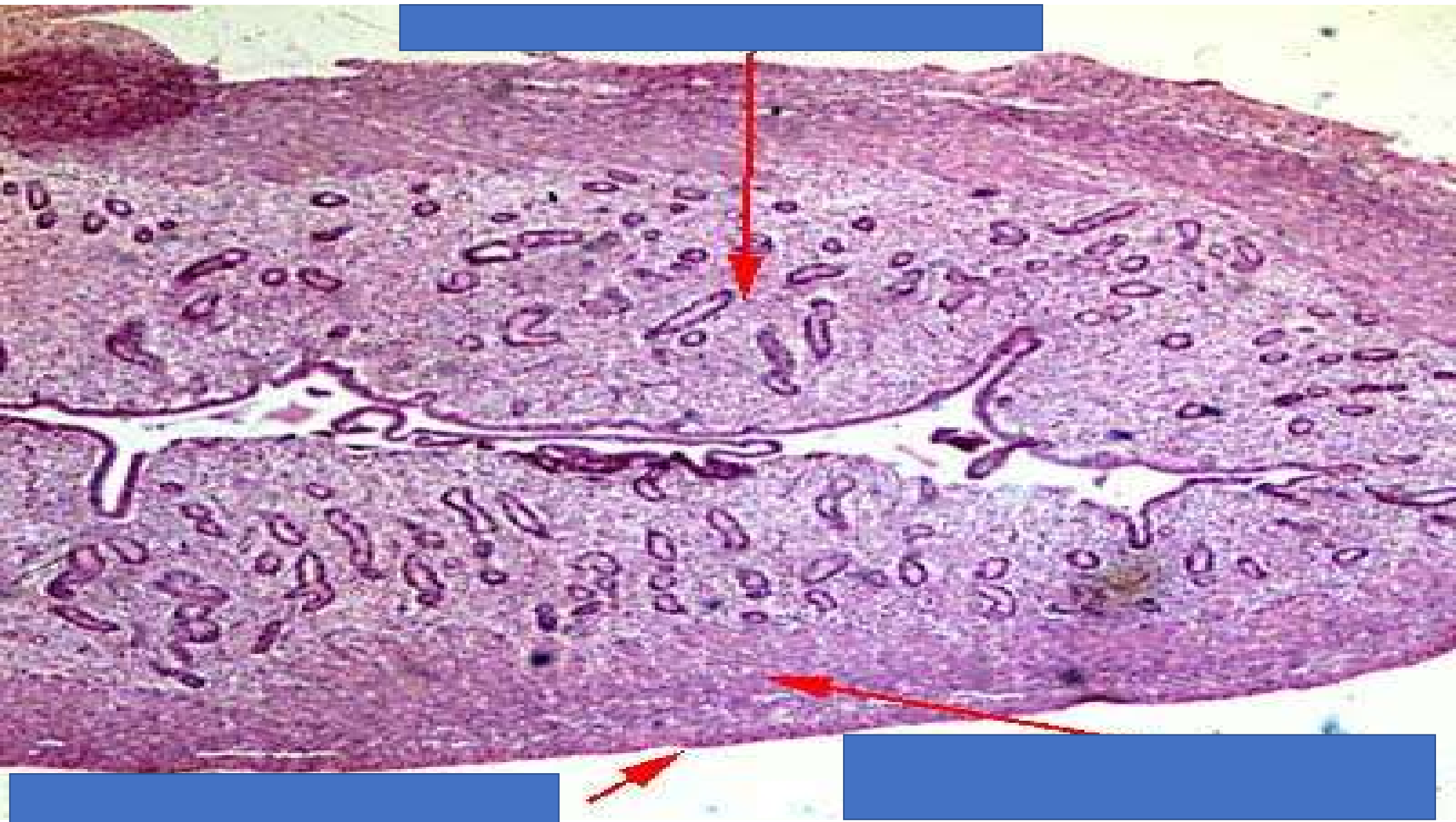


(c) Uterine wall

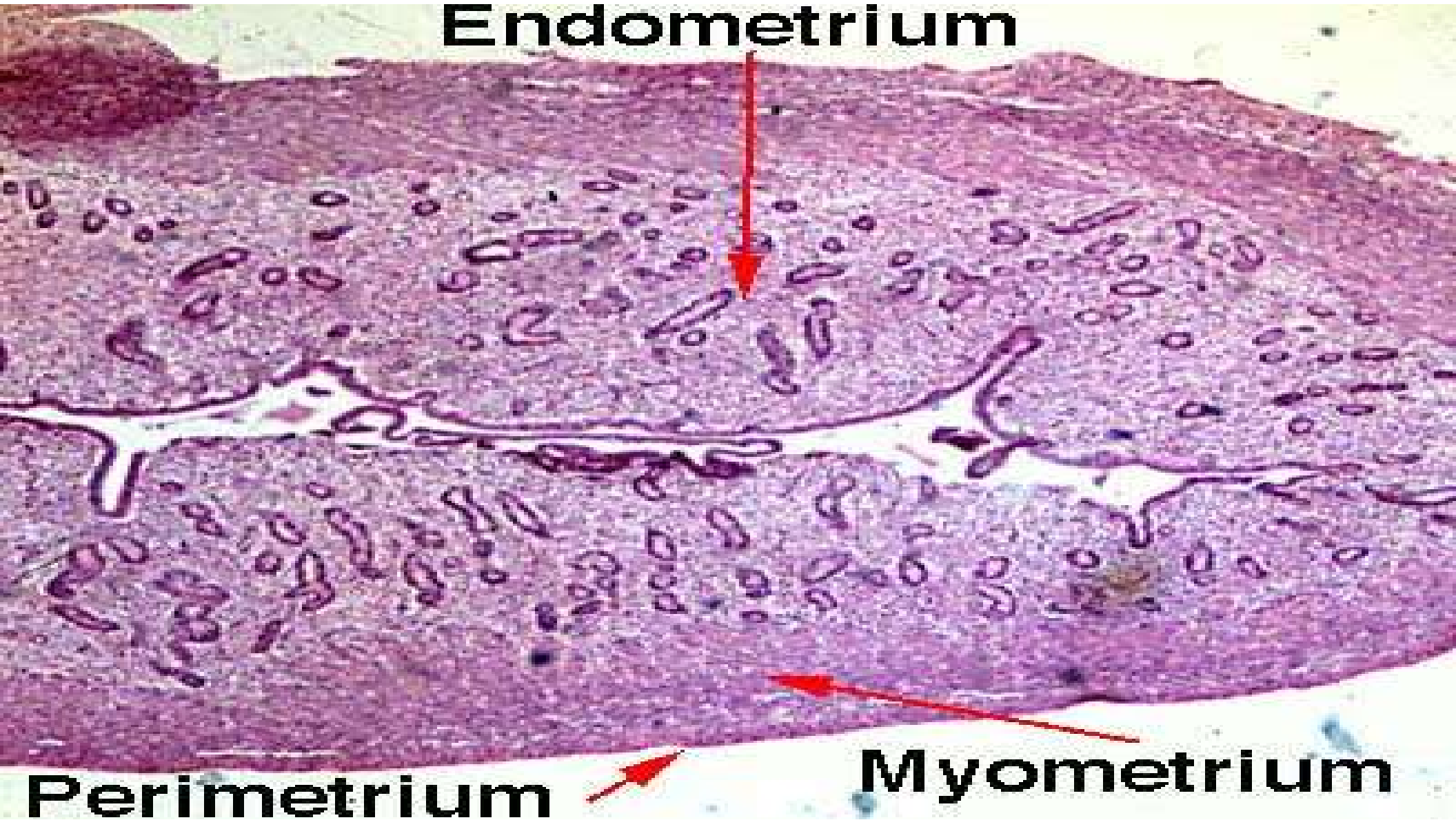
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(c) Uterine wall

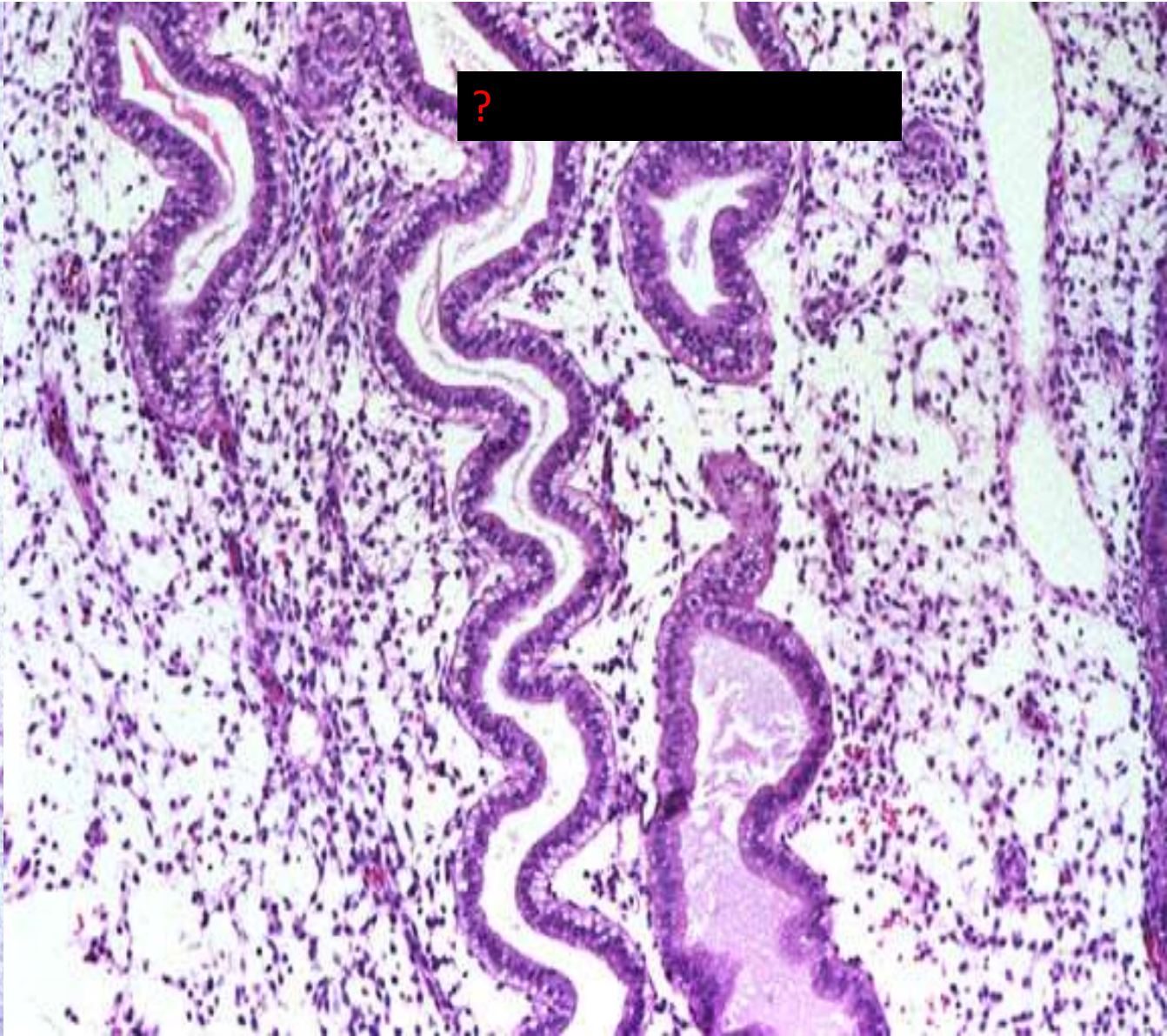
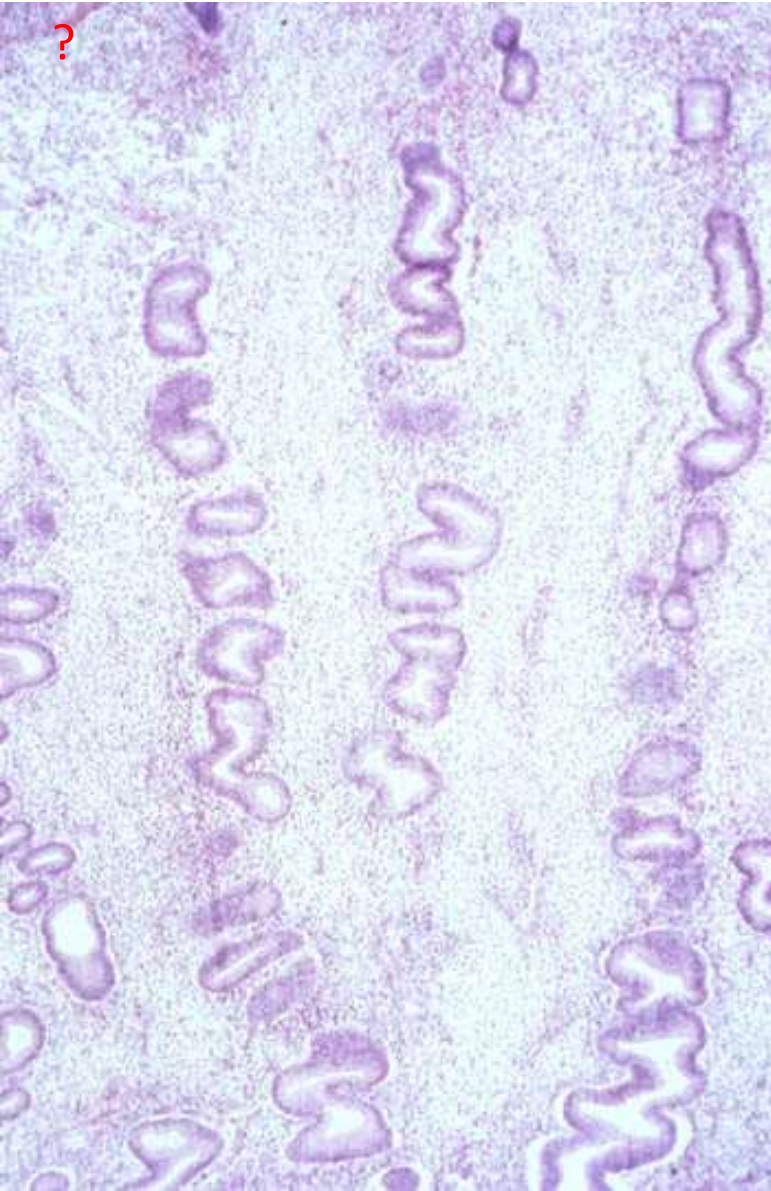


Endometrium

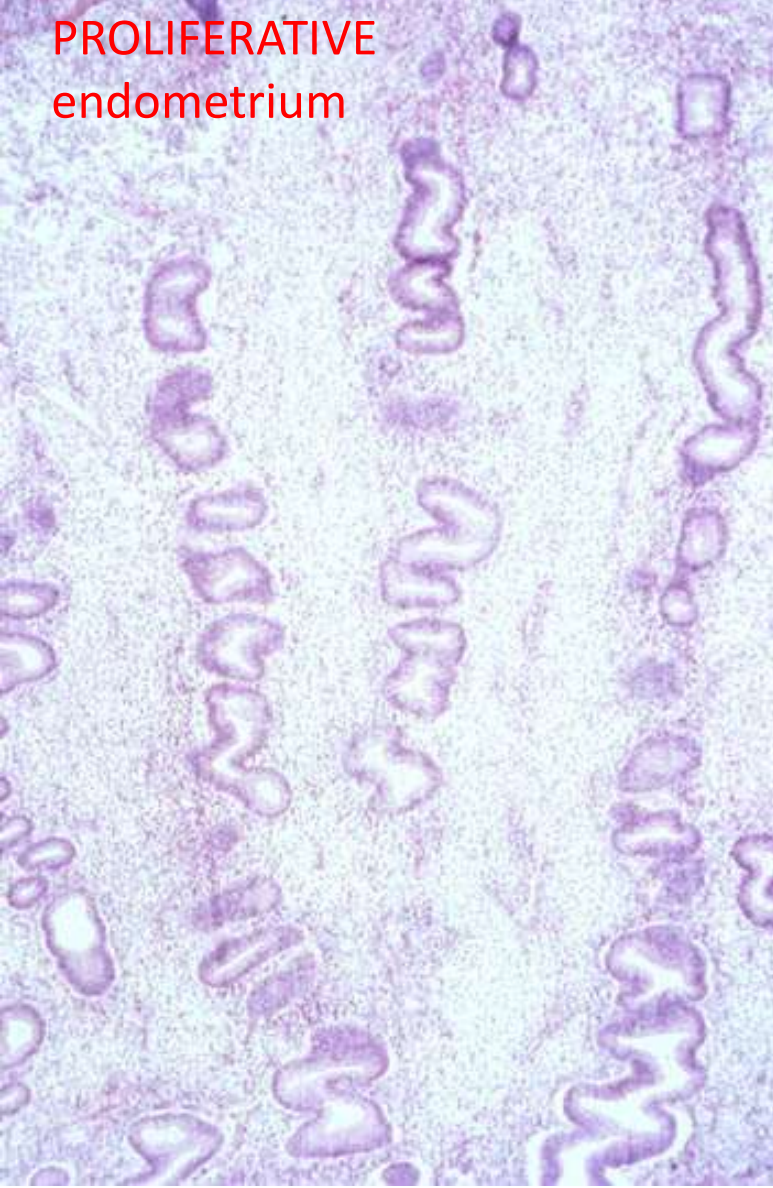


Perimetrium

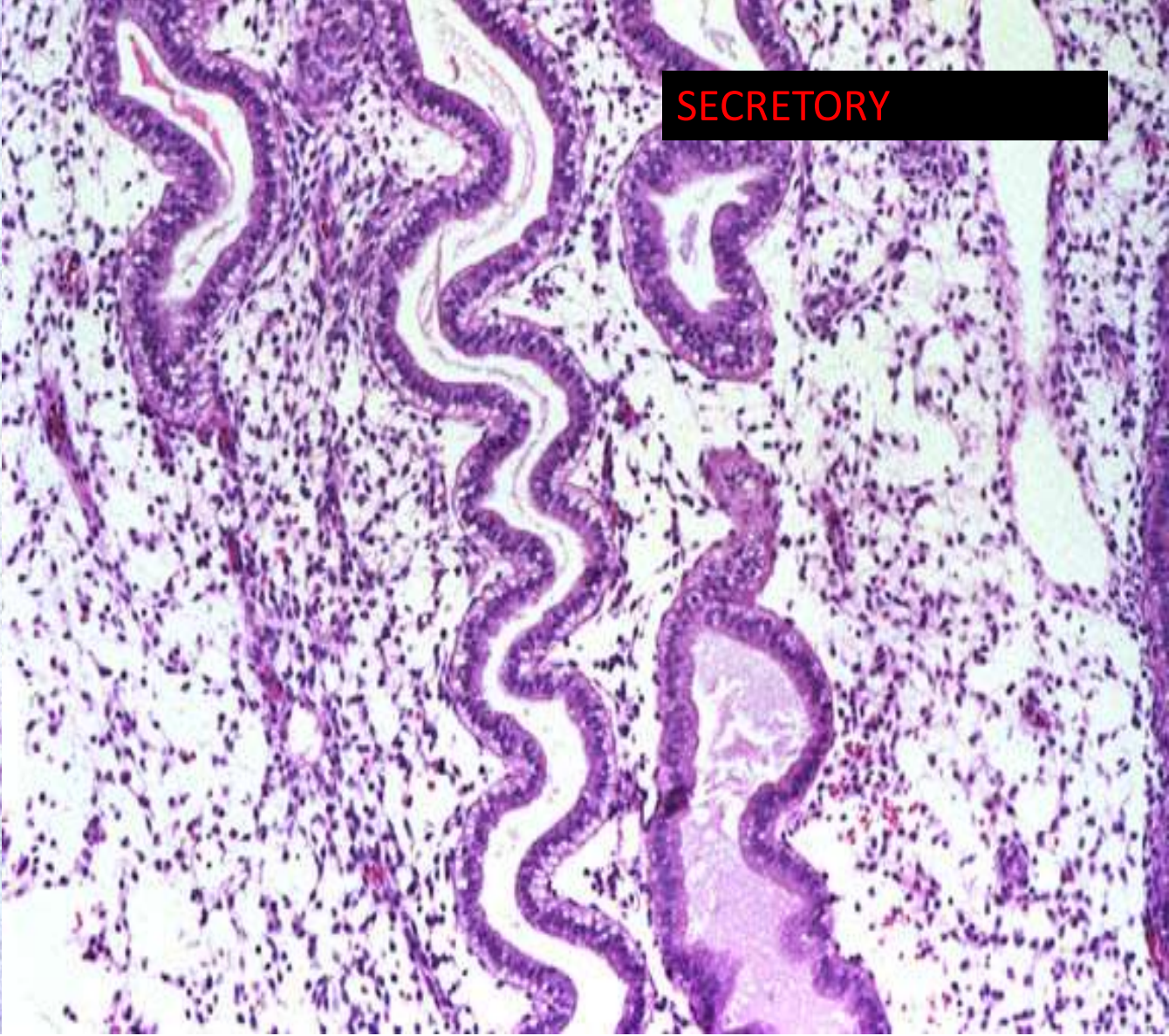
Myometrium

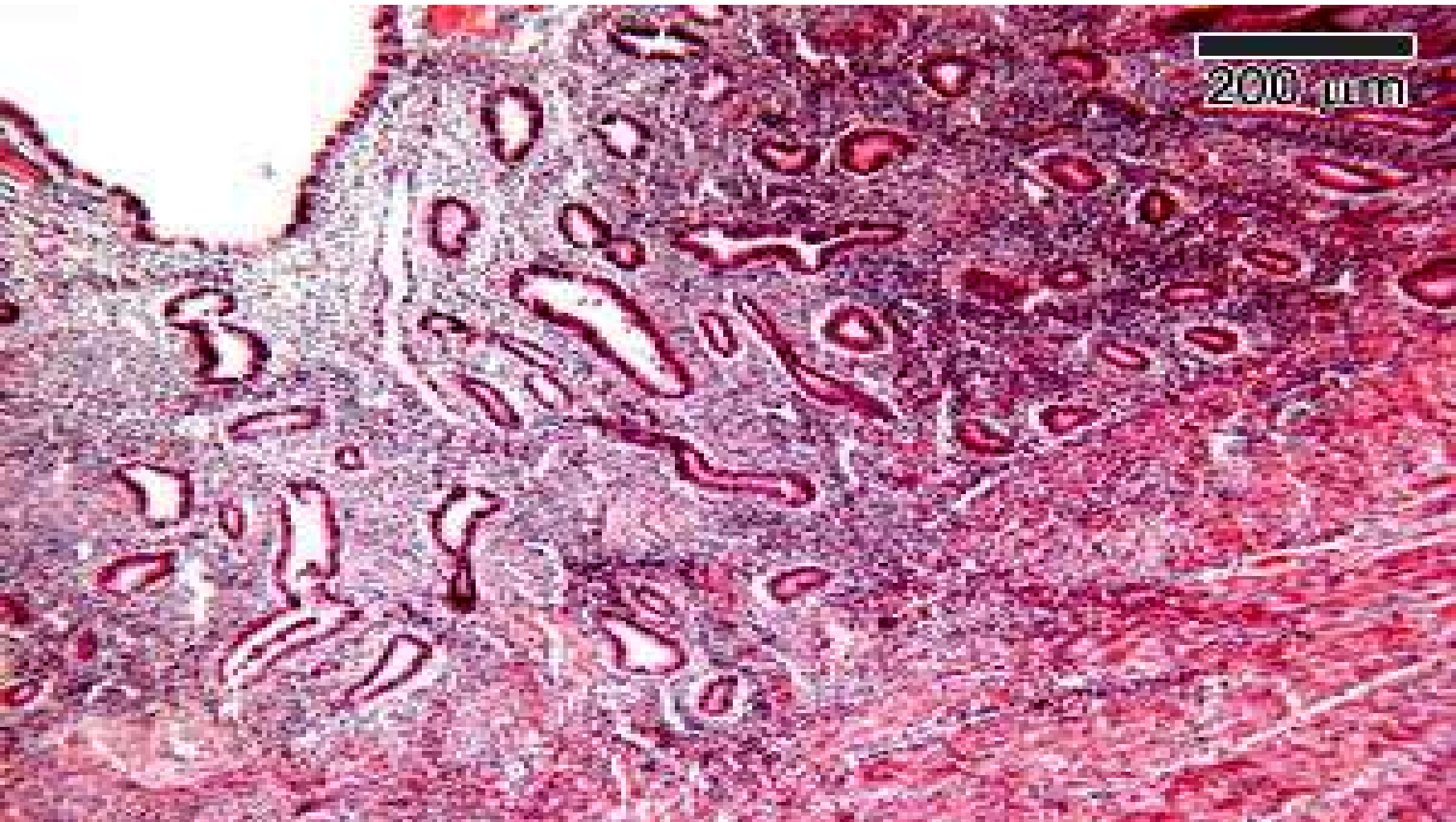


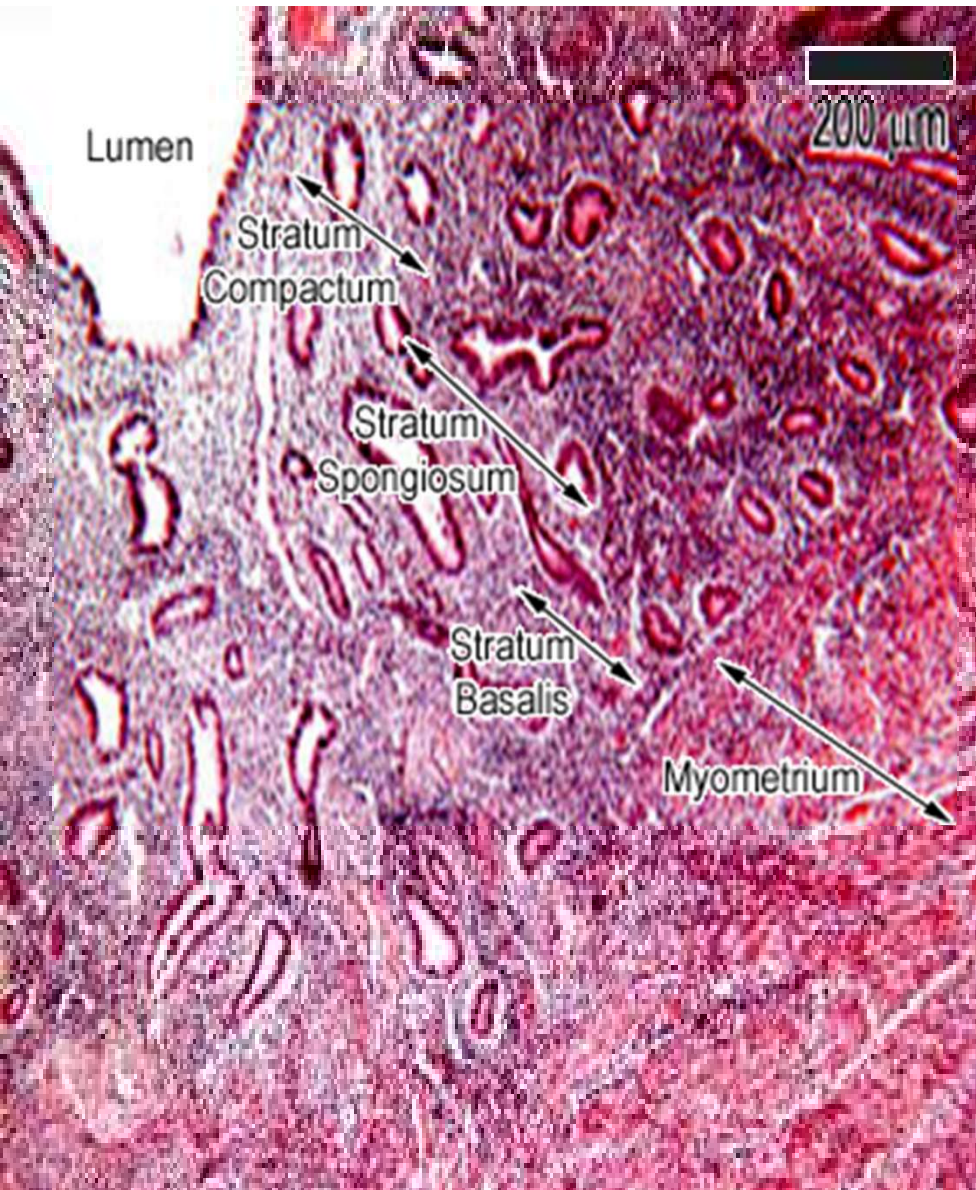
PROLIFERATIVE
endometrium



SECRETORY



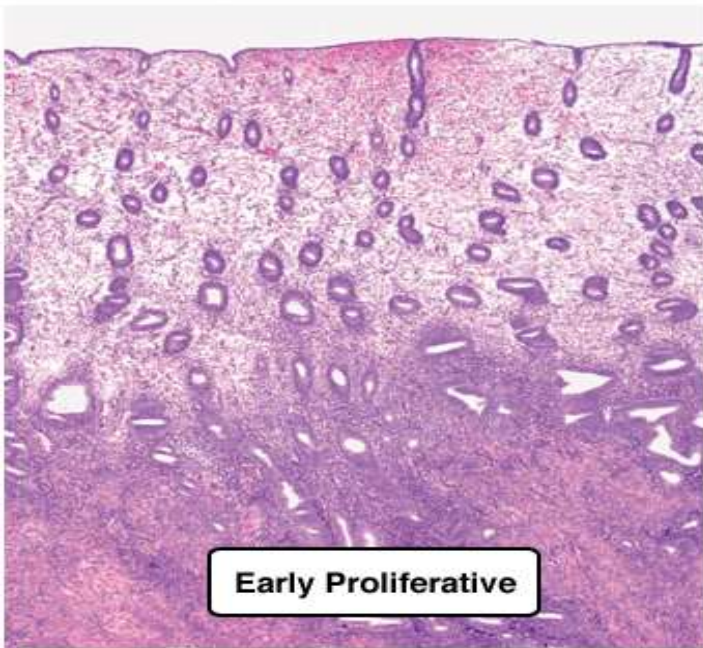




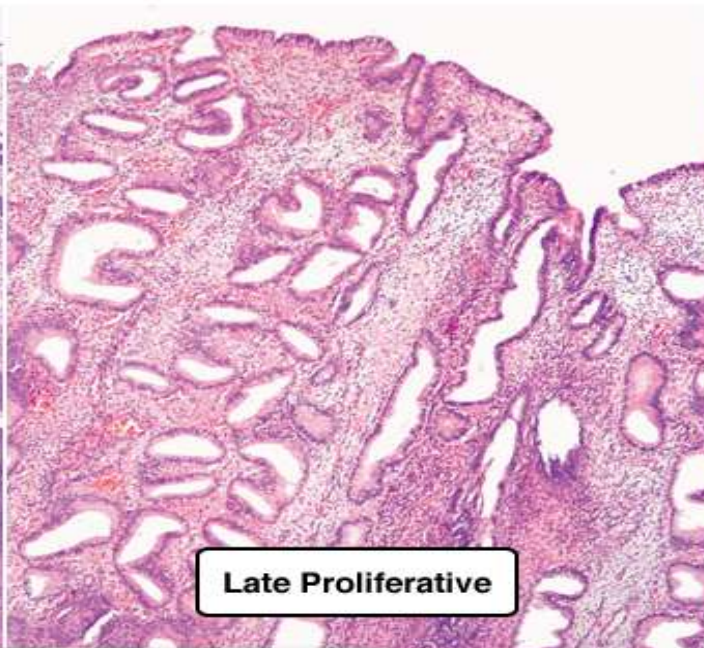
Proliferative Phase

In the proliferative phase, facilitated by FSH, the endometrium thickens, connective tissue is renewed, along with glandular structures and efferent arteries. Oestrogen causes the endometrial stroma to become deep and richly vascularised.

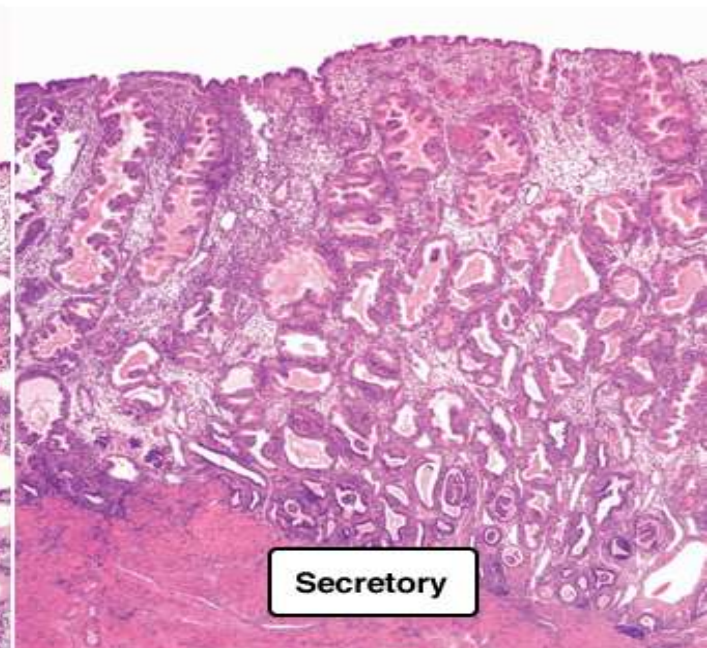
Simple tubular glands in the stratum functionalis open out onto the surface, and the endometrium thickens.



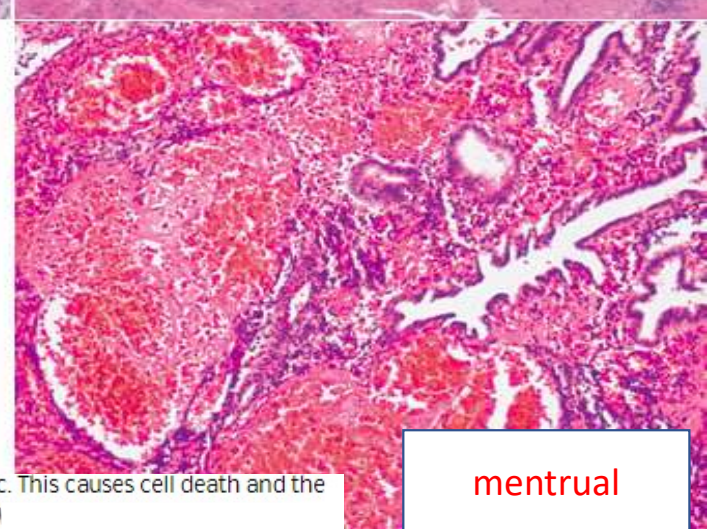
Early Proliferative



Late Proliferative



Secretory

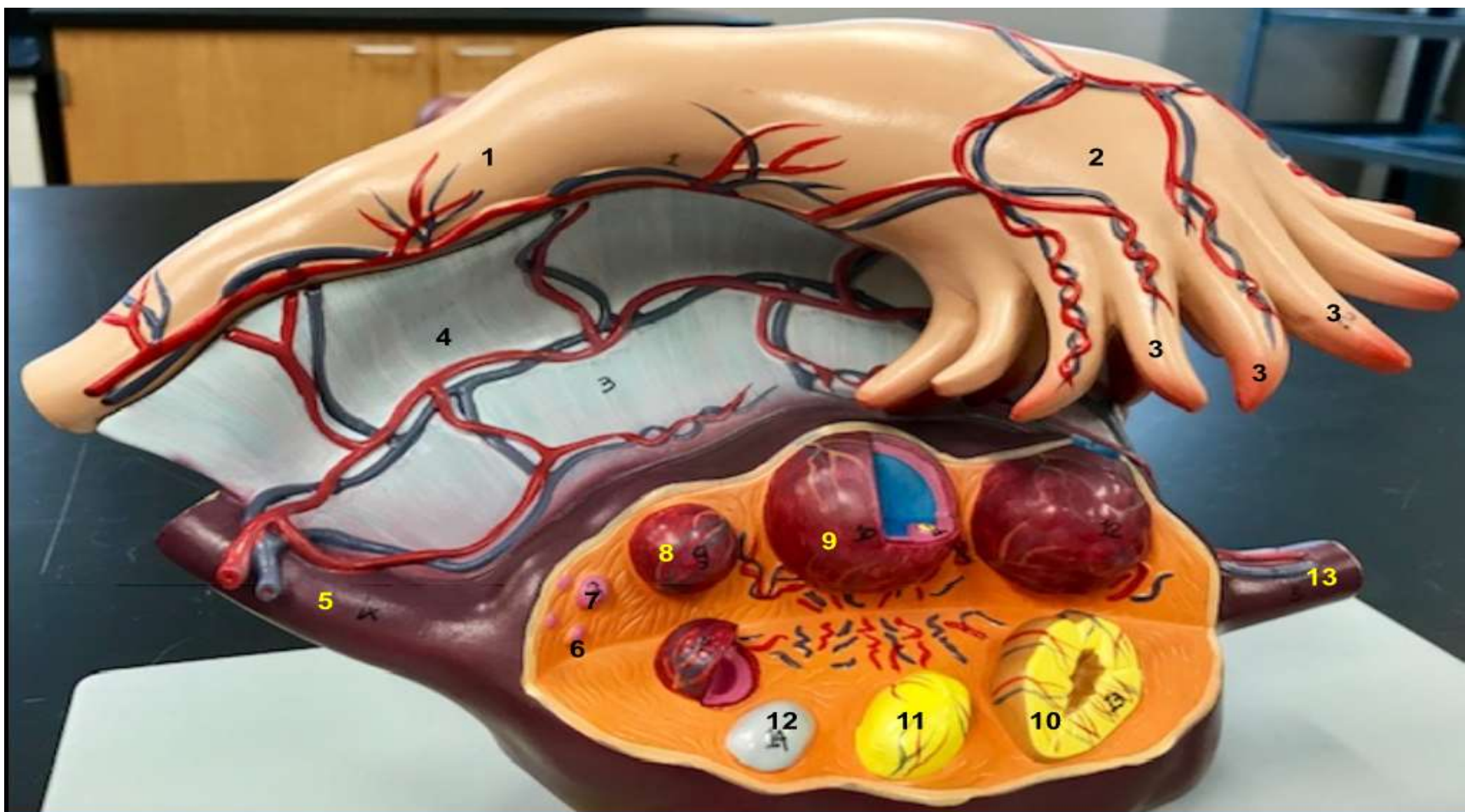


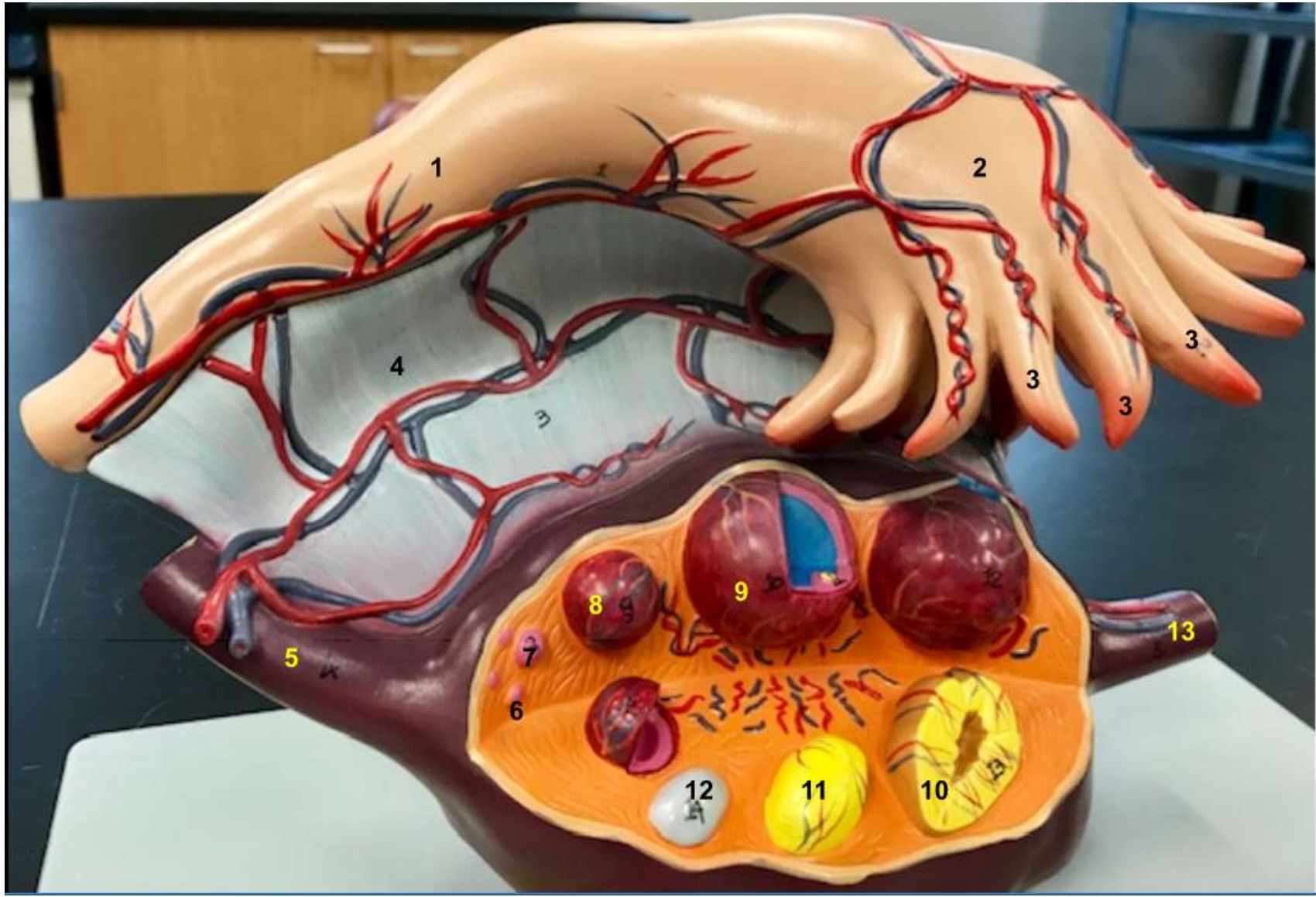
menstrual

Uterine Cycle

The early proliferative phase of the uterine cycle begins at the end of menstrual flow. The uterine glands in this phase are sparse and relatively small, and the epithelial cells develop microvilli and cilia under the influence of estrogen. The late proliferative phase reveals an increased thickness of the stratum functionalis, and the glands are more coiled and densely packed. The secretory phase of the uterine cycle begins at ovulation. In this phase, the glands become even more complexly coiled and the endometrial lining reaches its maximal thickness, whereas the stratum basalis and myometrium remain relatively unchanged. Note the saw-toothed appearance of the glands. Secretions rich in glycogen and glycoprotein can be observed in the lumina of the glands. If fertilization does not occur, the placental tissue does not produce hCG and the corpus luteum degenerates. The uterine lining does not receive the progesterone, causing the spiral arteries constrict and the endometrial tissue to become ischemic. This causes cell death and the

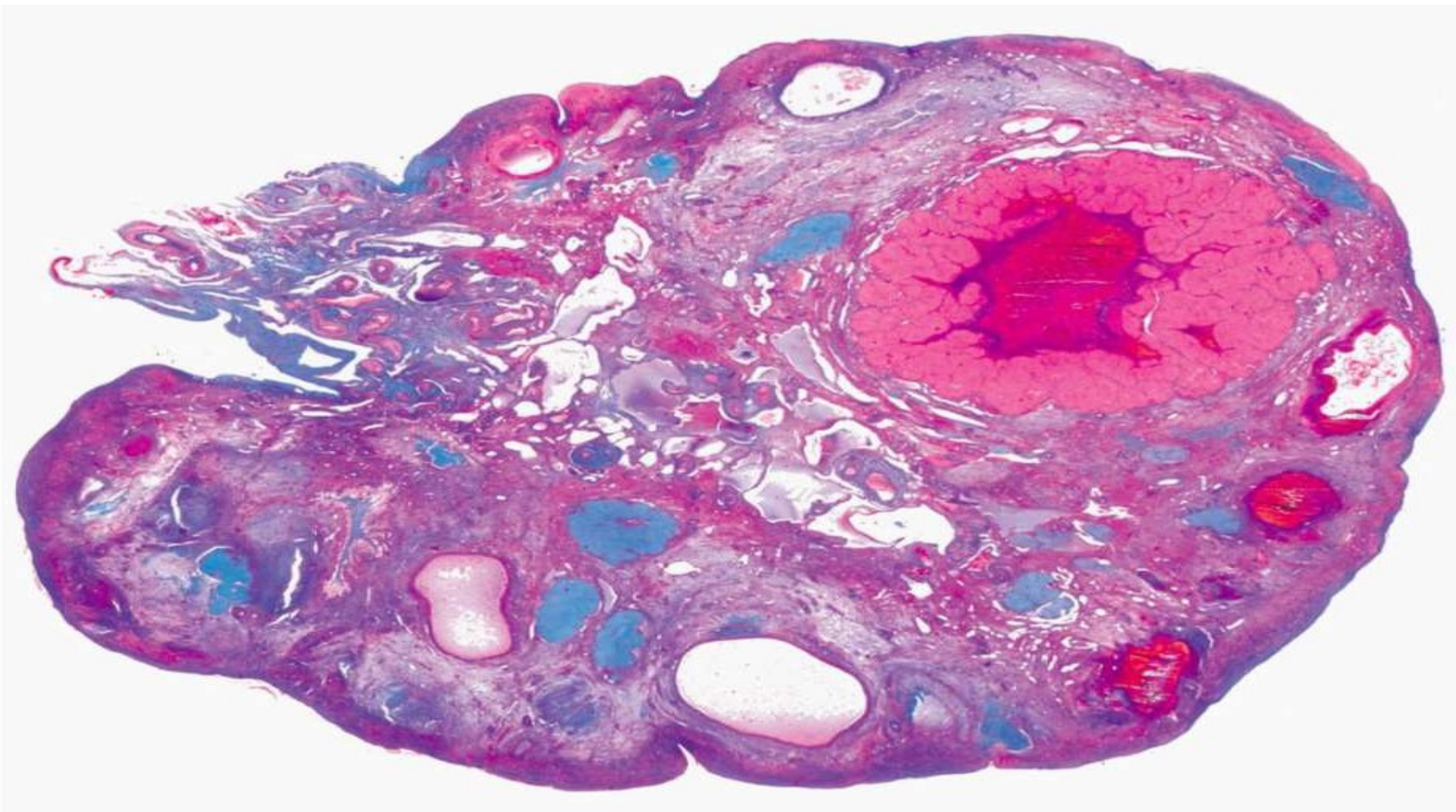
sloughing of the stratum functionalis. 1

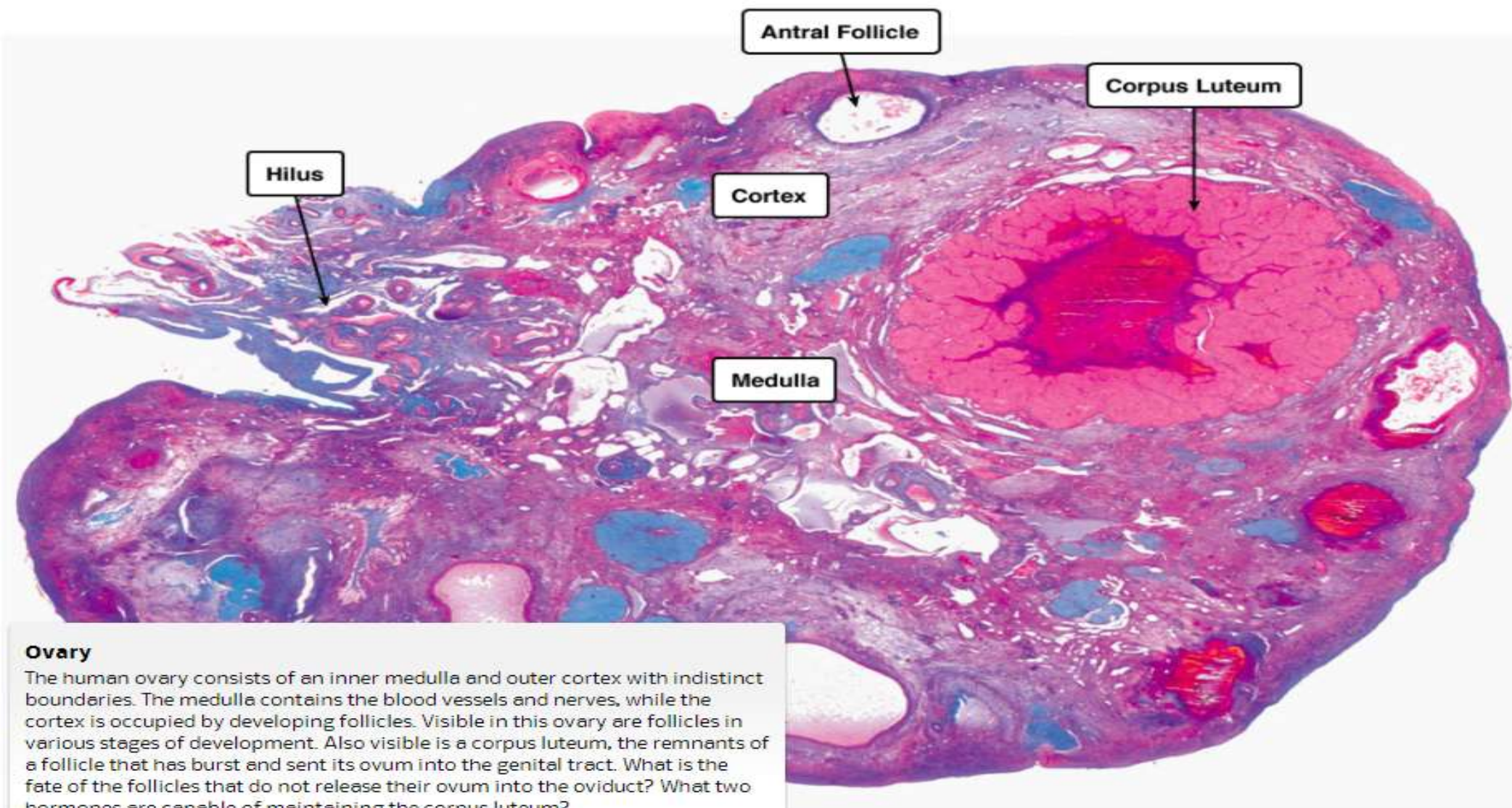




This model shows us many structures met previously, including:

1. Ampulla of fallopian tube
2. Infundibulum of fallopian tube
3. Fimbriae of fallopian tube
4. Broad ligament
5. Ovarian ligament
6. Primordial follicles
7. Primary follicle
8. Secondary follicle
9. Graafian follicle
10. Corpus luteum
11. Degenerating corpus luteum
12. Corpus albicans
13. Suspensory ligament



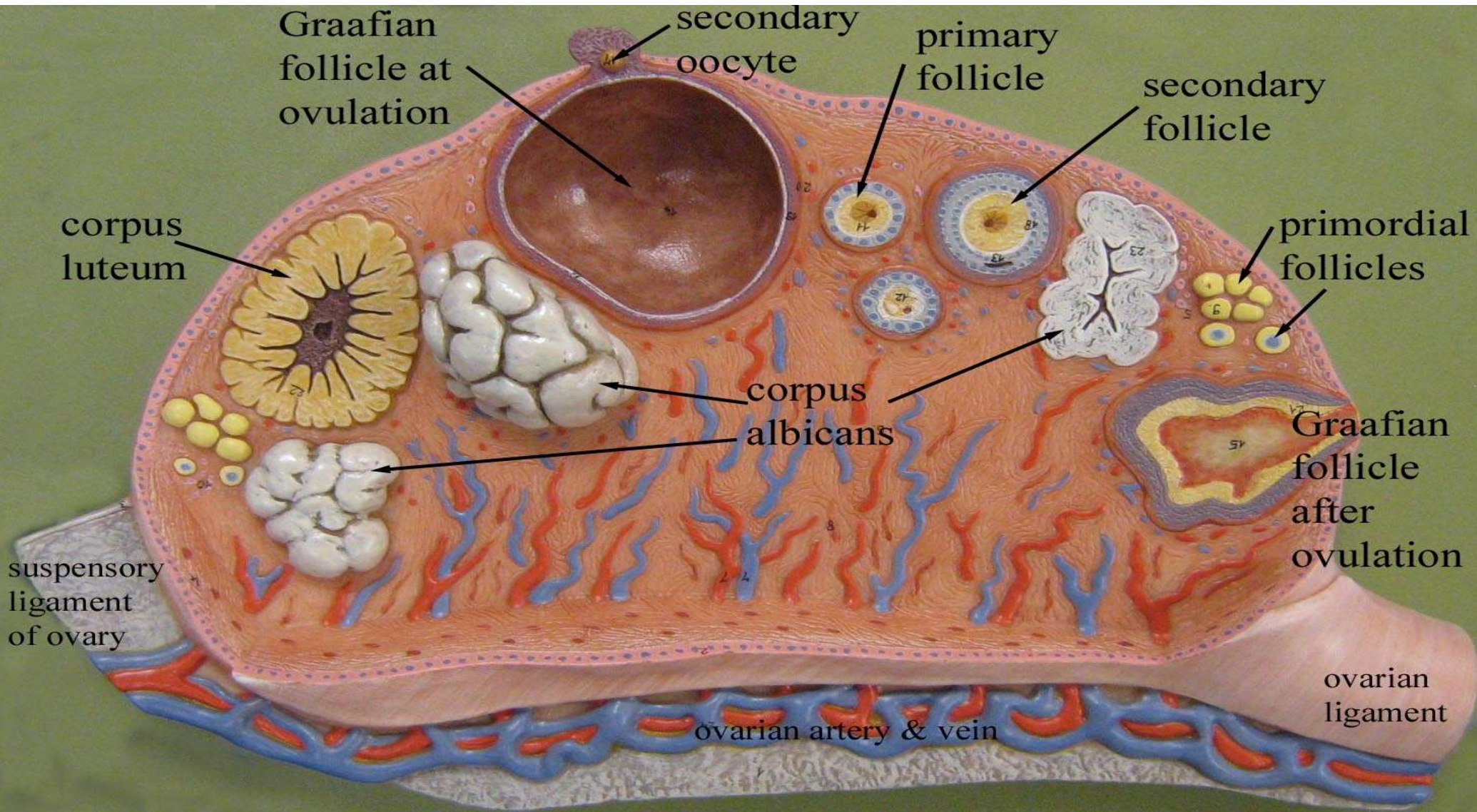


Ovary

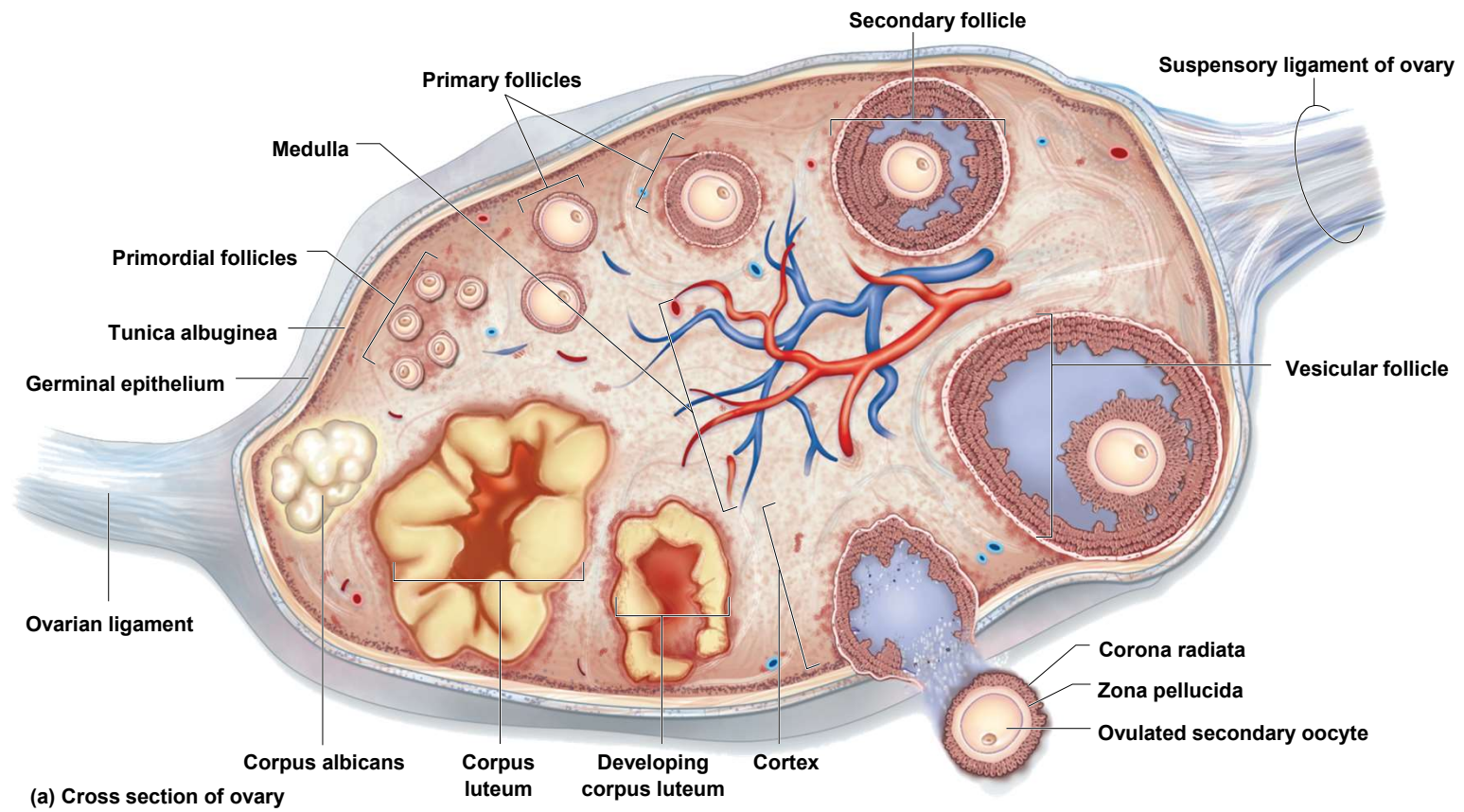
The human ovary consists of an inner medulla and outer cortex with indistinct boundaries. The medulla contains the blood vessels and nerves, while the cortex is occupied by developing follicles. Visible in this ovary are follicles in various stages of development. Also visible is a corpus luteum, the remnants of a follicle that has burst and sent its ovum into the genital tract. What is the fate of the follicles that do not release their ovum into the oviduct? What two hormones are capable of maintaining the corpus luteum?

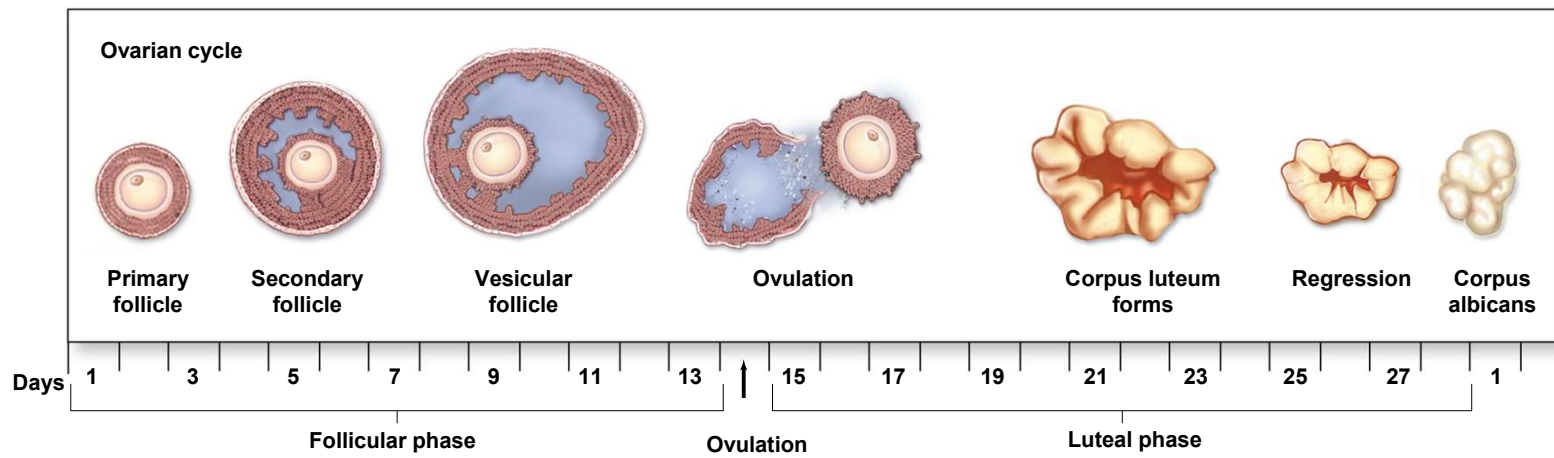
Answer:

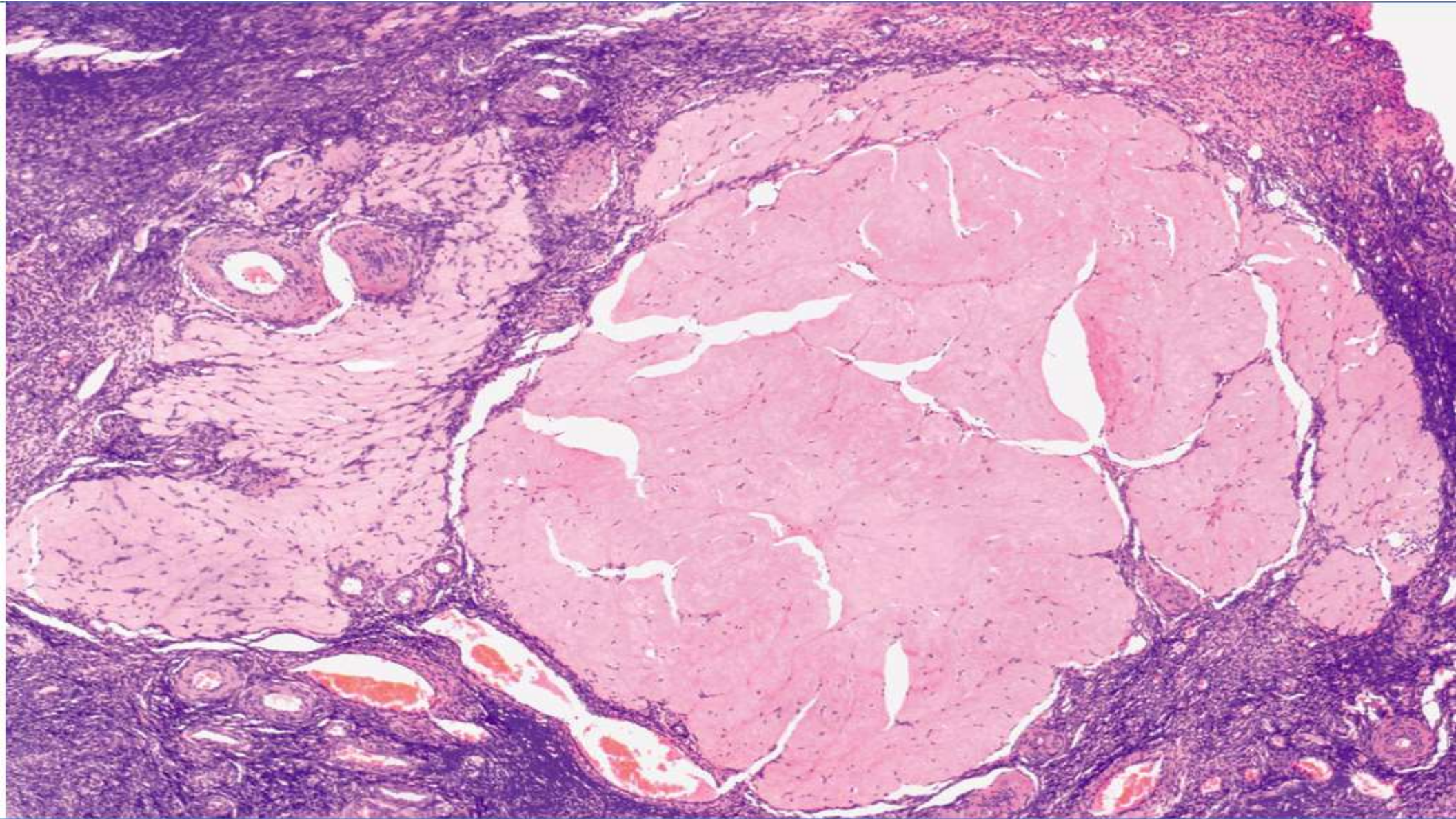


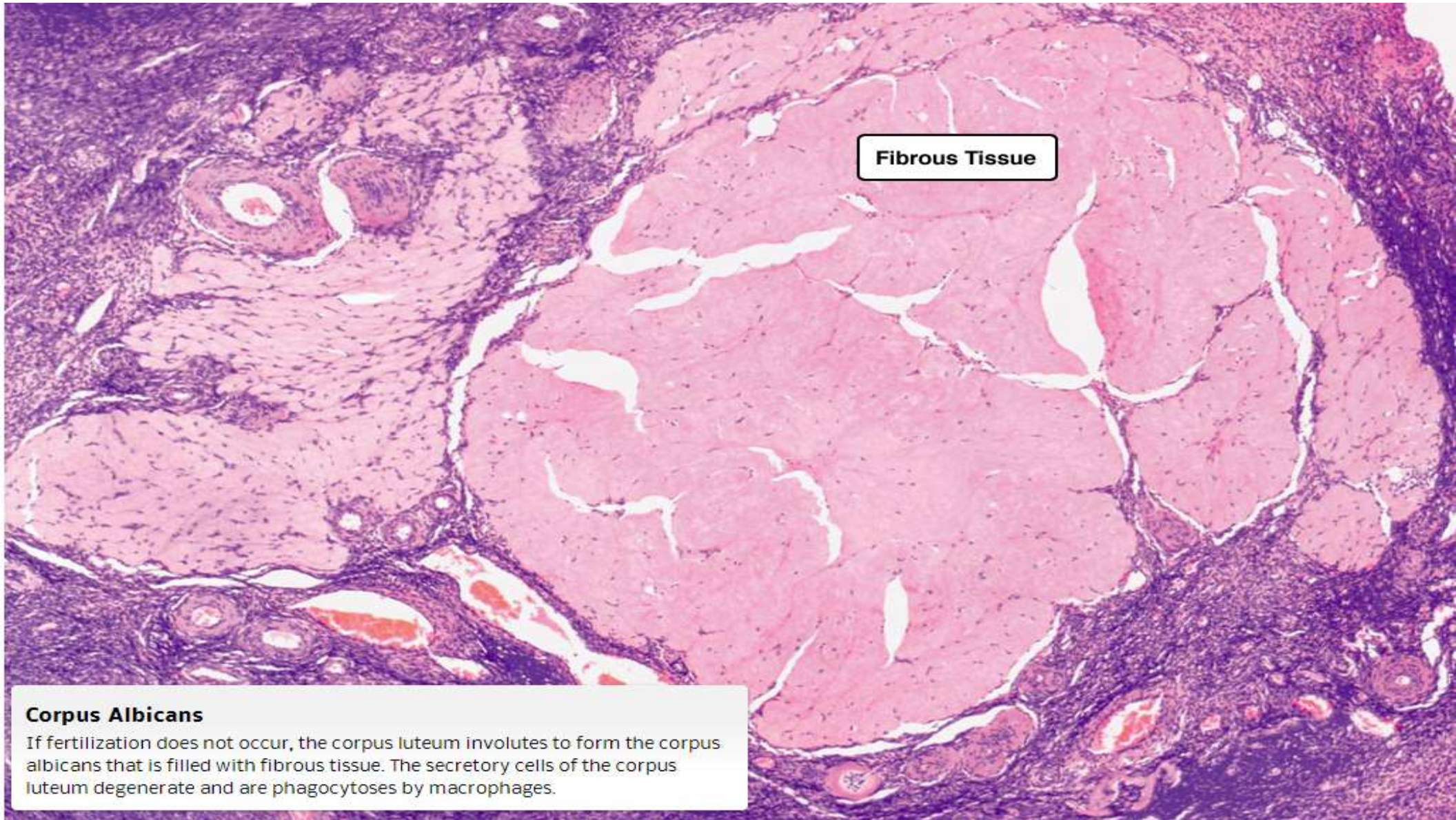








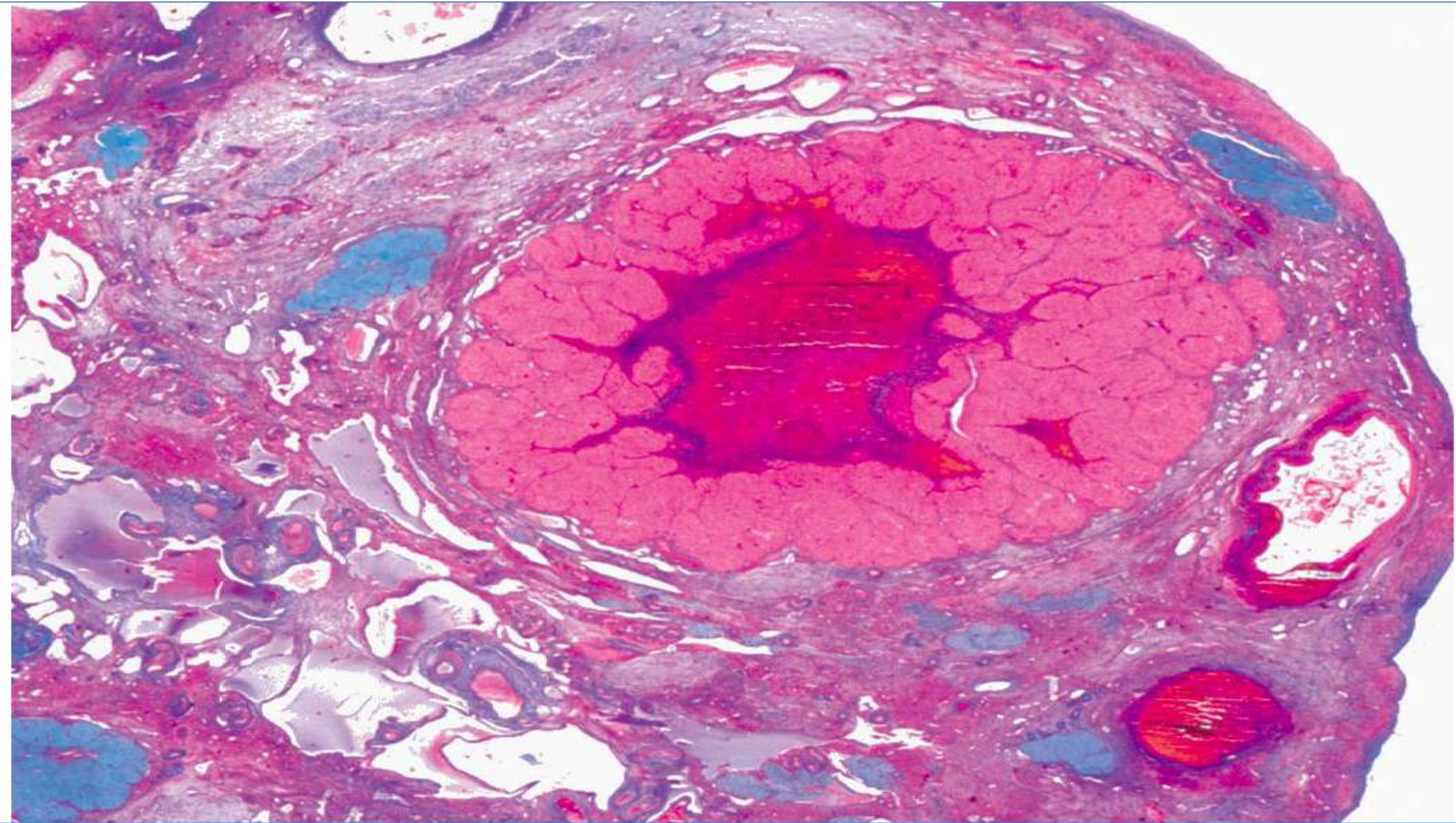


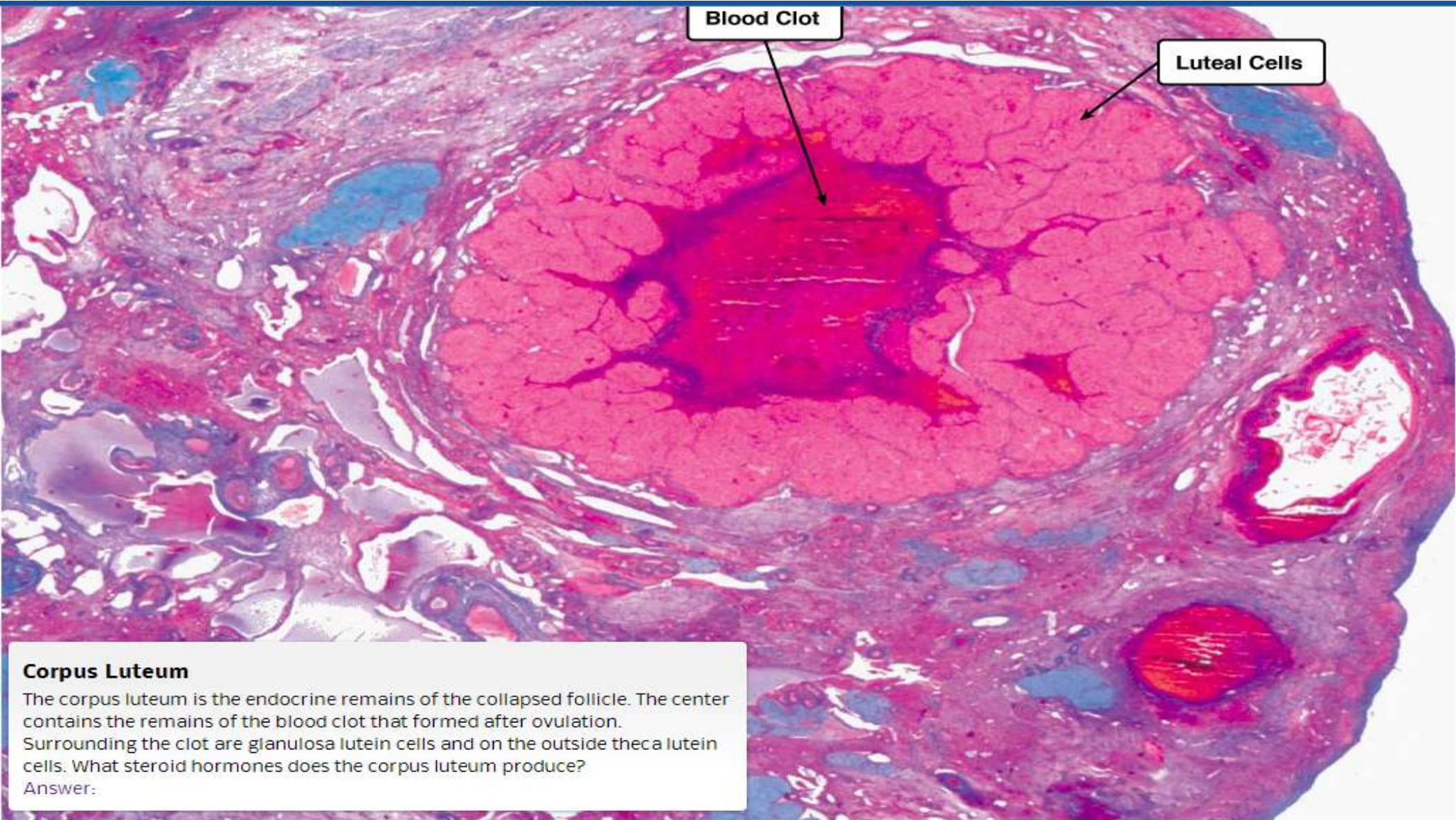


Fibrous Tissue

Corpus Albicans

If fertilization does not occur, the corpus luteum involutes to form the corpus albicans that is filled with fibrous tissue. The secretory cells of the corpus luteum degenerate and are phagocytosed by macrophages.

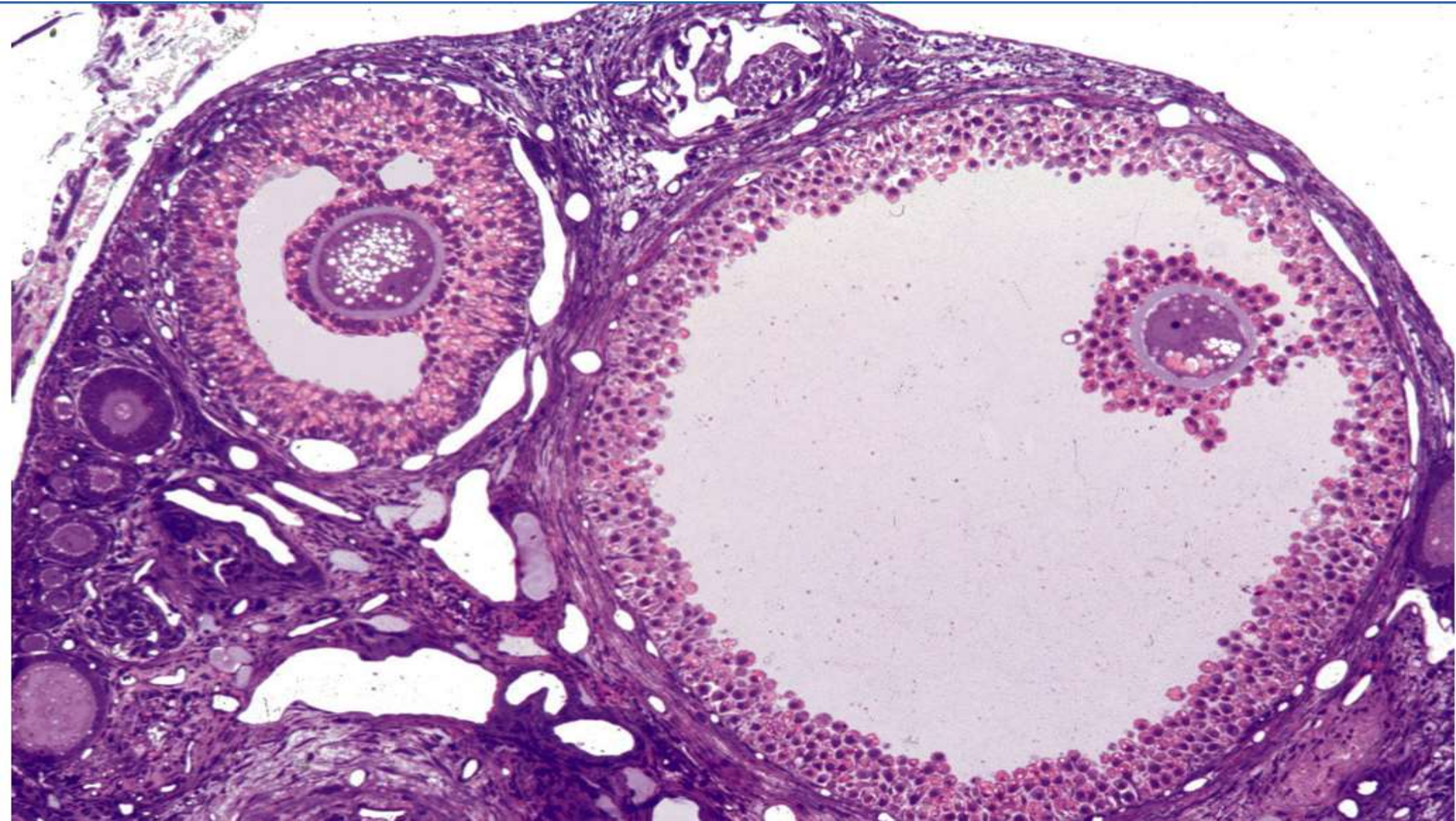


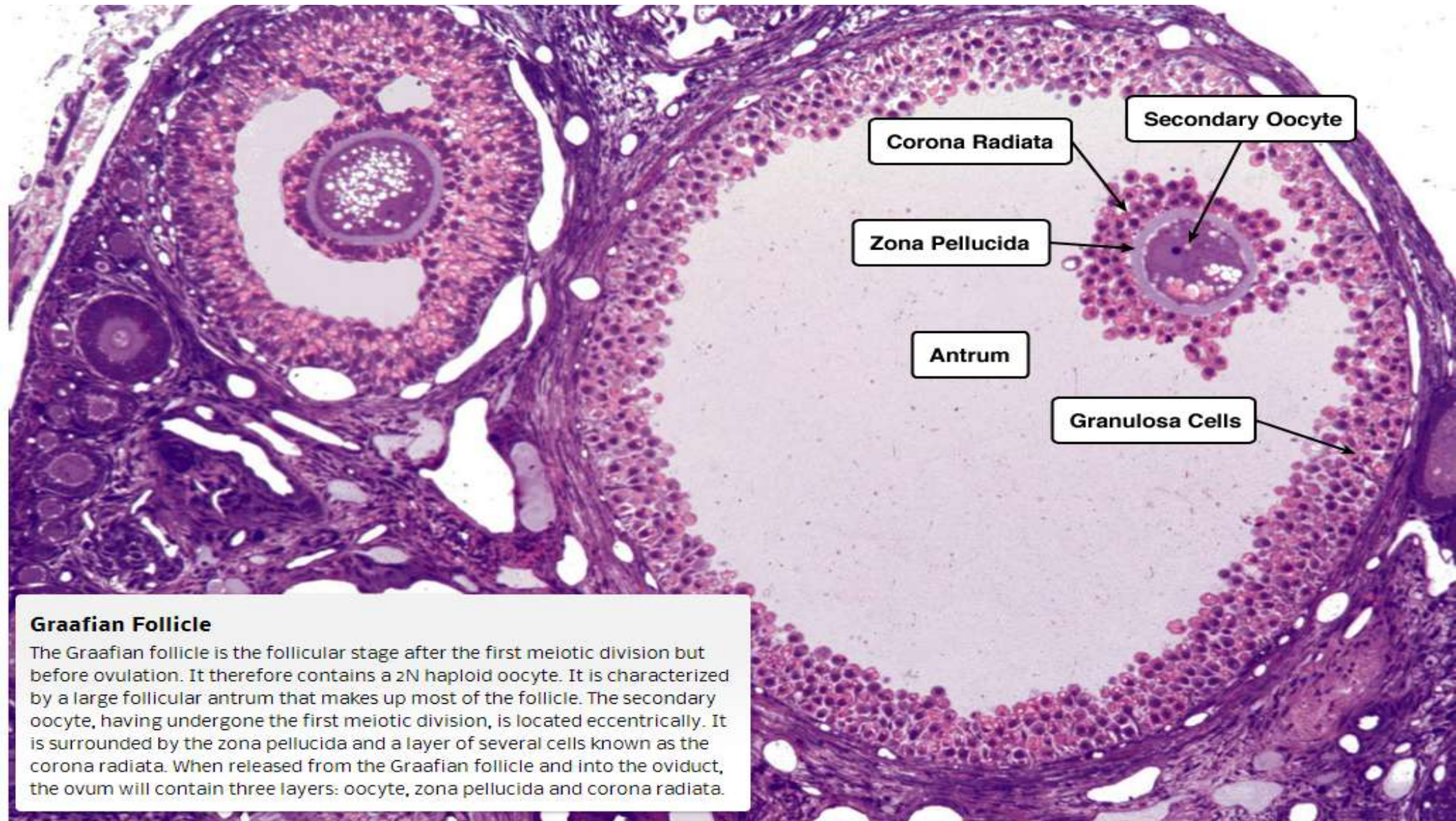


Corpus Luteum

The corpus luteum is the endocrine remains of the collapsed follicle. The center contains the remains of the blood clot that formed after ovulation. Surrounding the clot are granulosa lutein cells and on the outside theca lutein cells. What steroid hormones does the corpus luteum produce?

Answer:

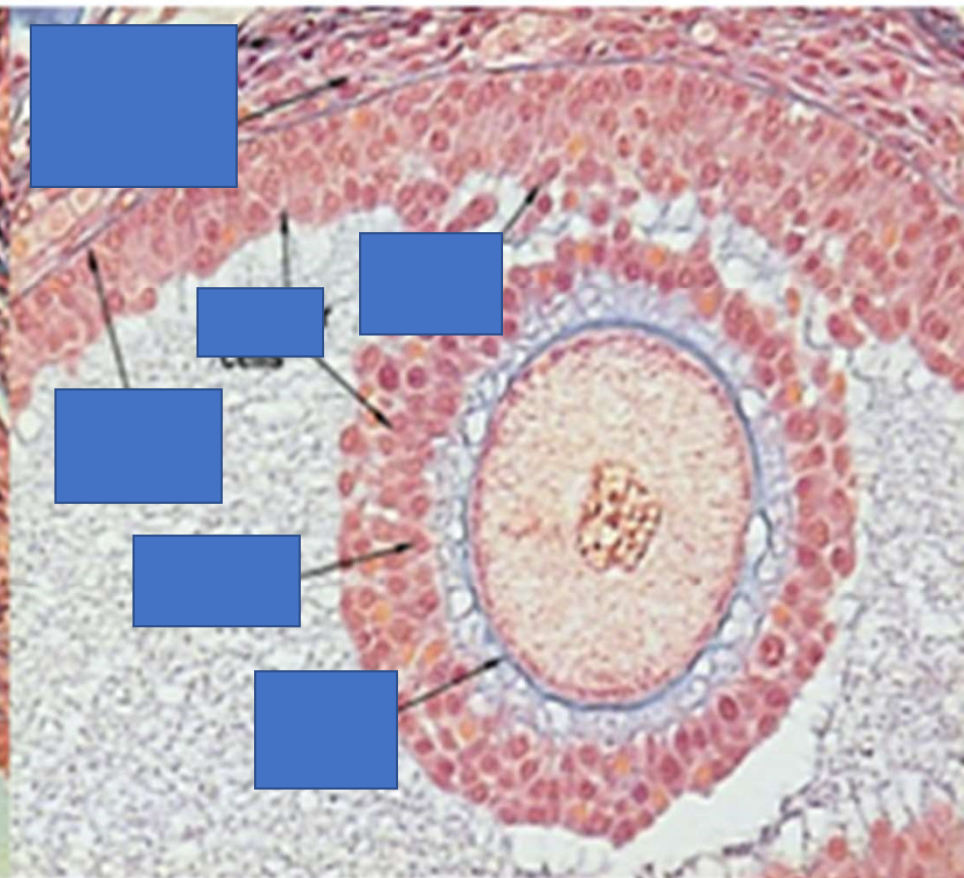
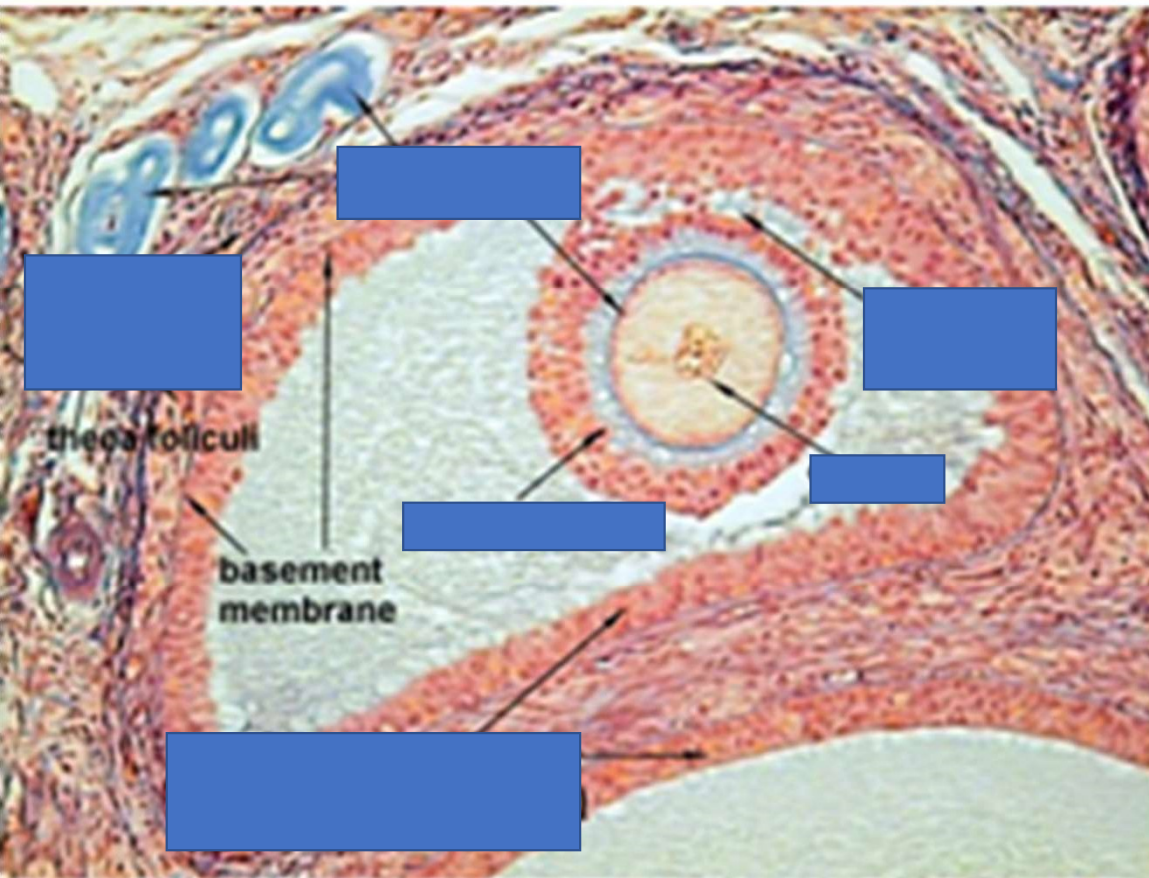


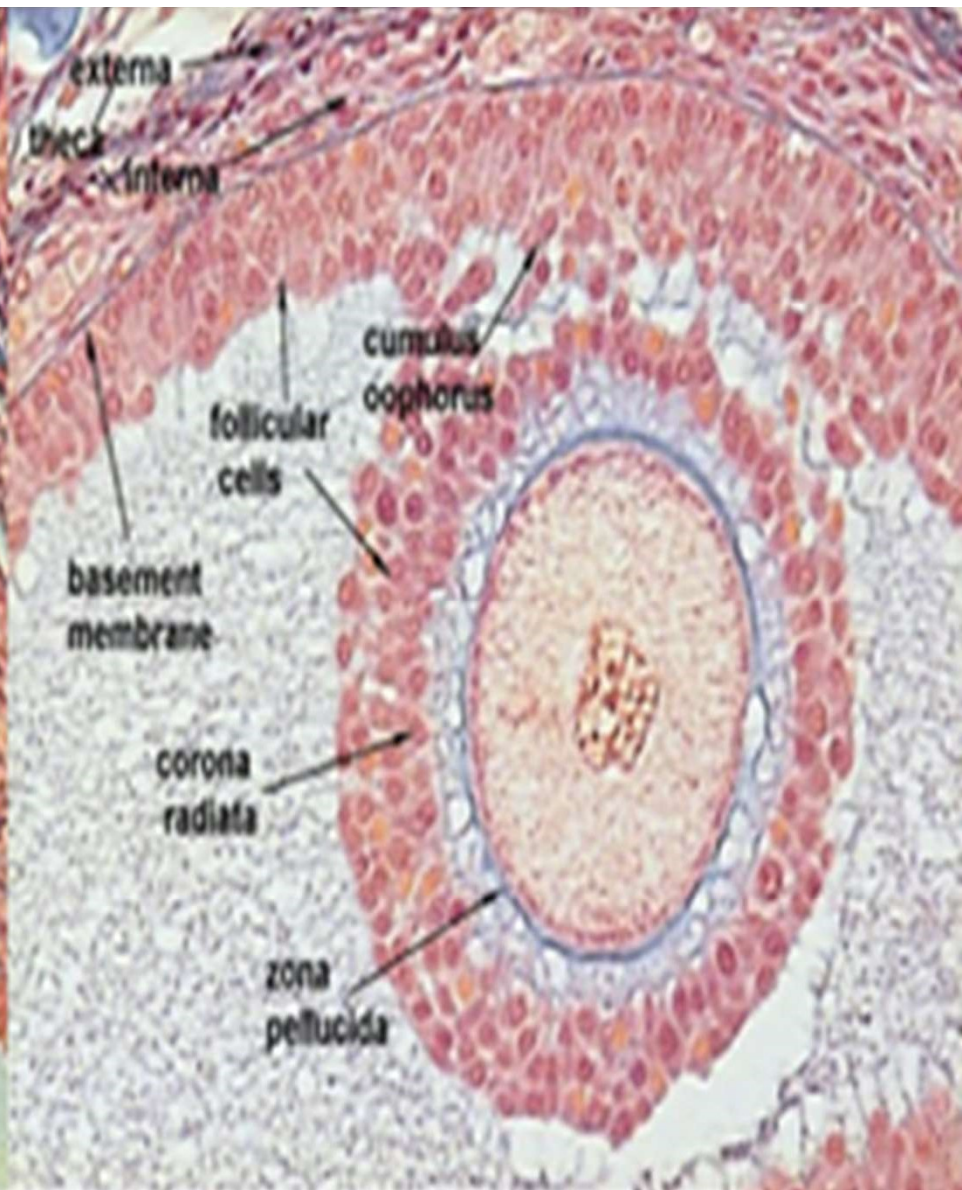
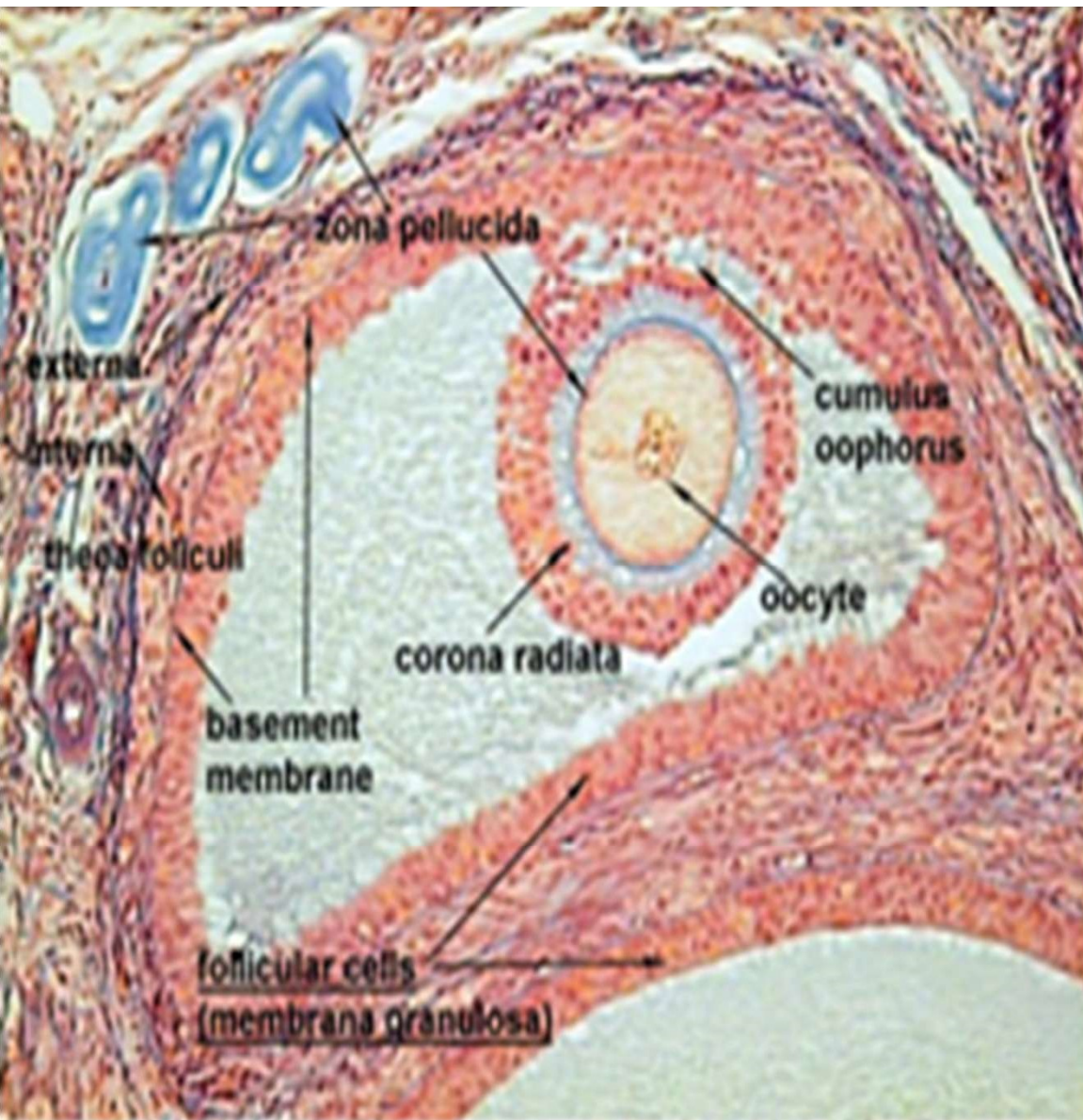


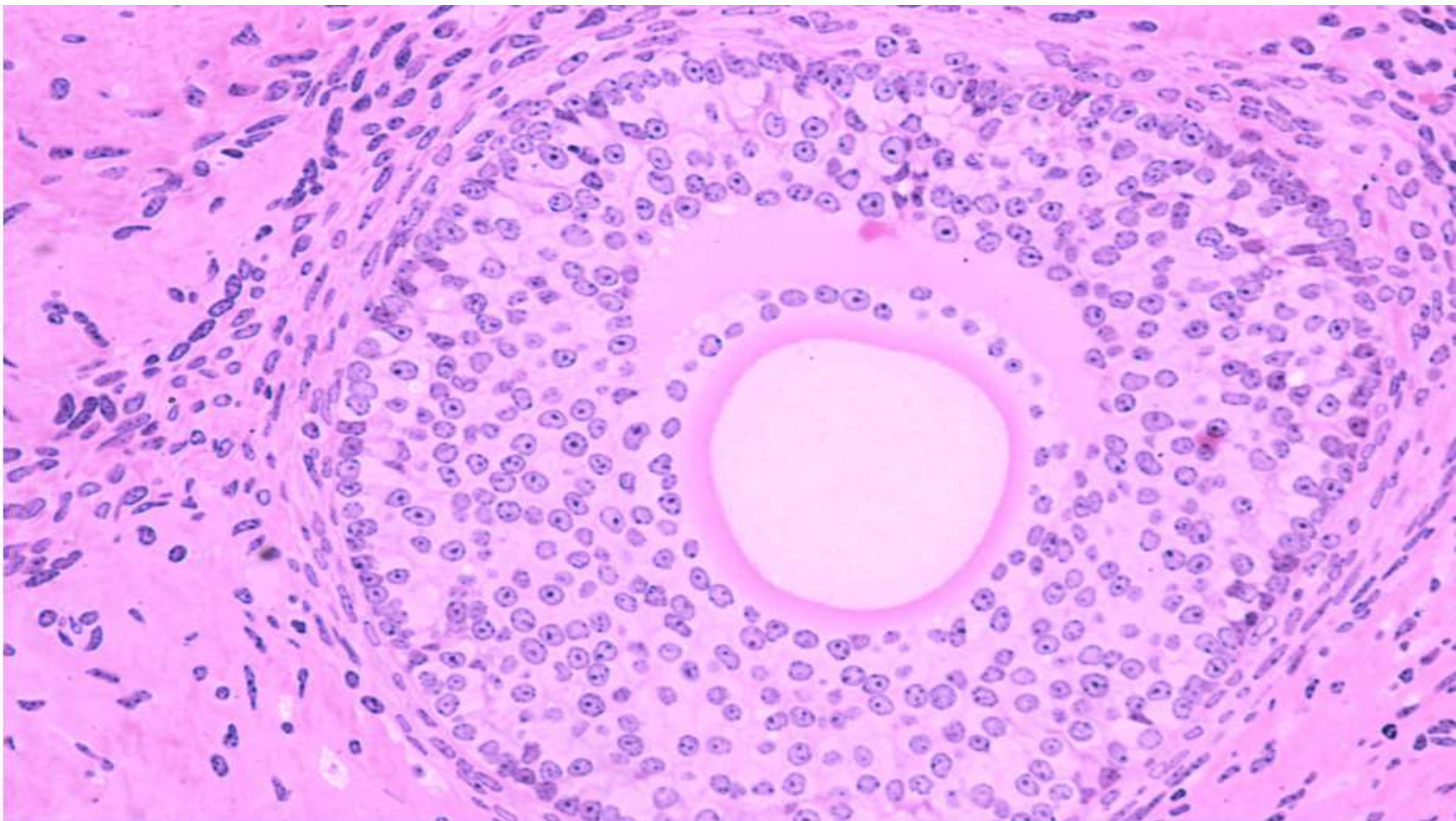
Graafian Follicle

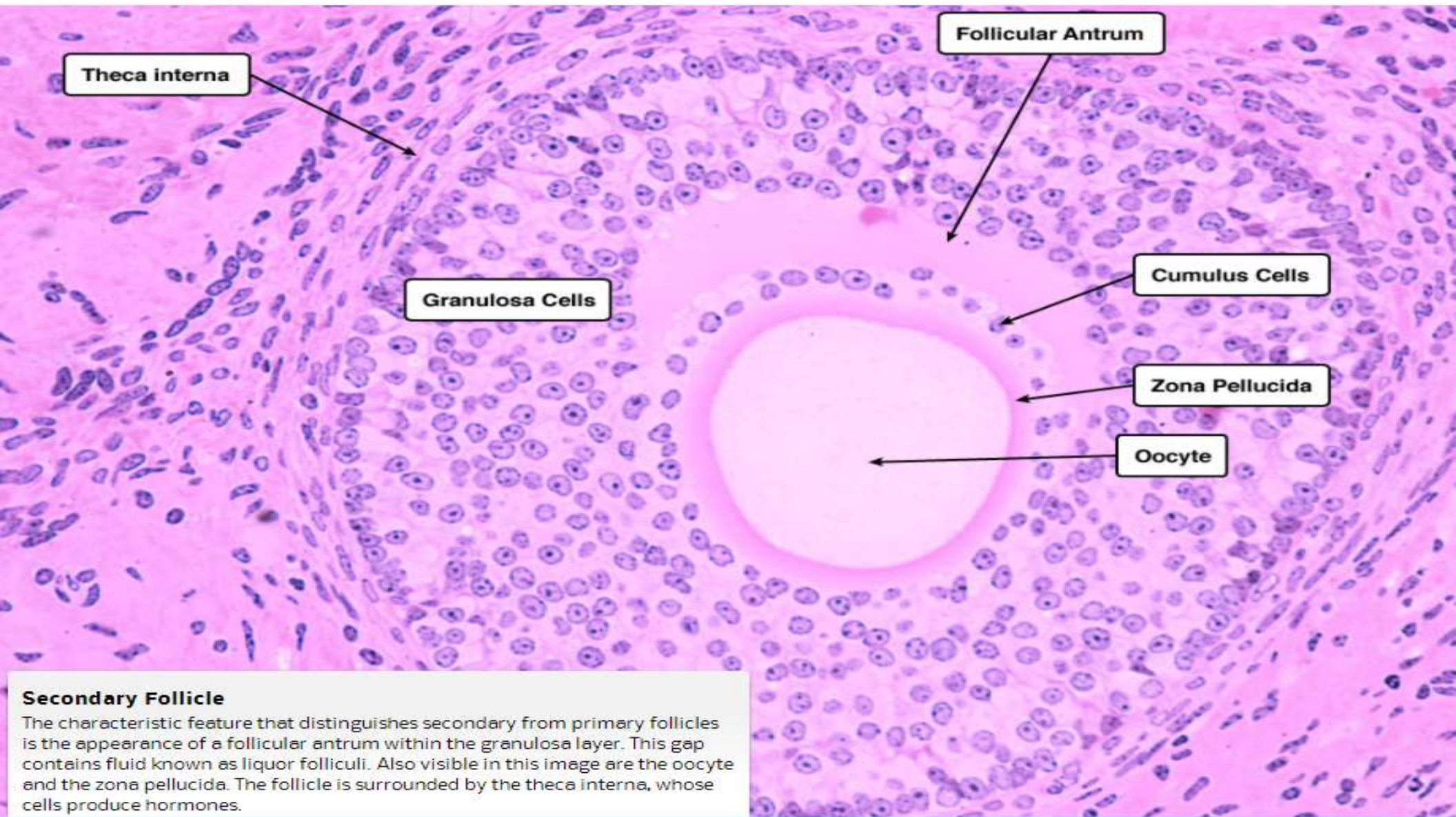
The Graafian follicle is the follicular stage after the first meiotic division but before ovulation. It therefore contains a $2N$ haploid oocyte. It is characterized by a large follicular antrum that makes up most of the follicle. The secondary oocyte, having undergone the first meiotic division, is located eccentrically. It is surrounded by the zona pellucida and a layer of several cells known as the corona radiata. When released from the Graafian follicle and into the oviduct, the ovum will contain three layers: oocyte, zona pellucida and corona radiata.

Ovaries



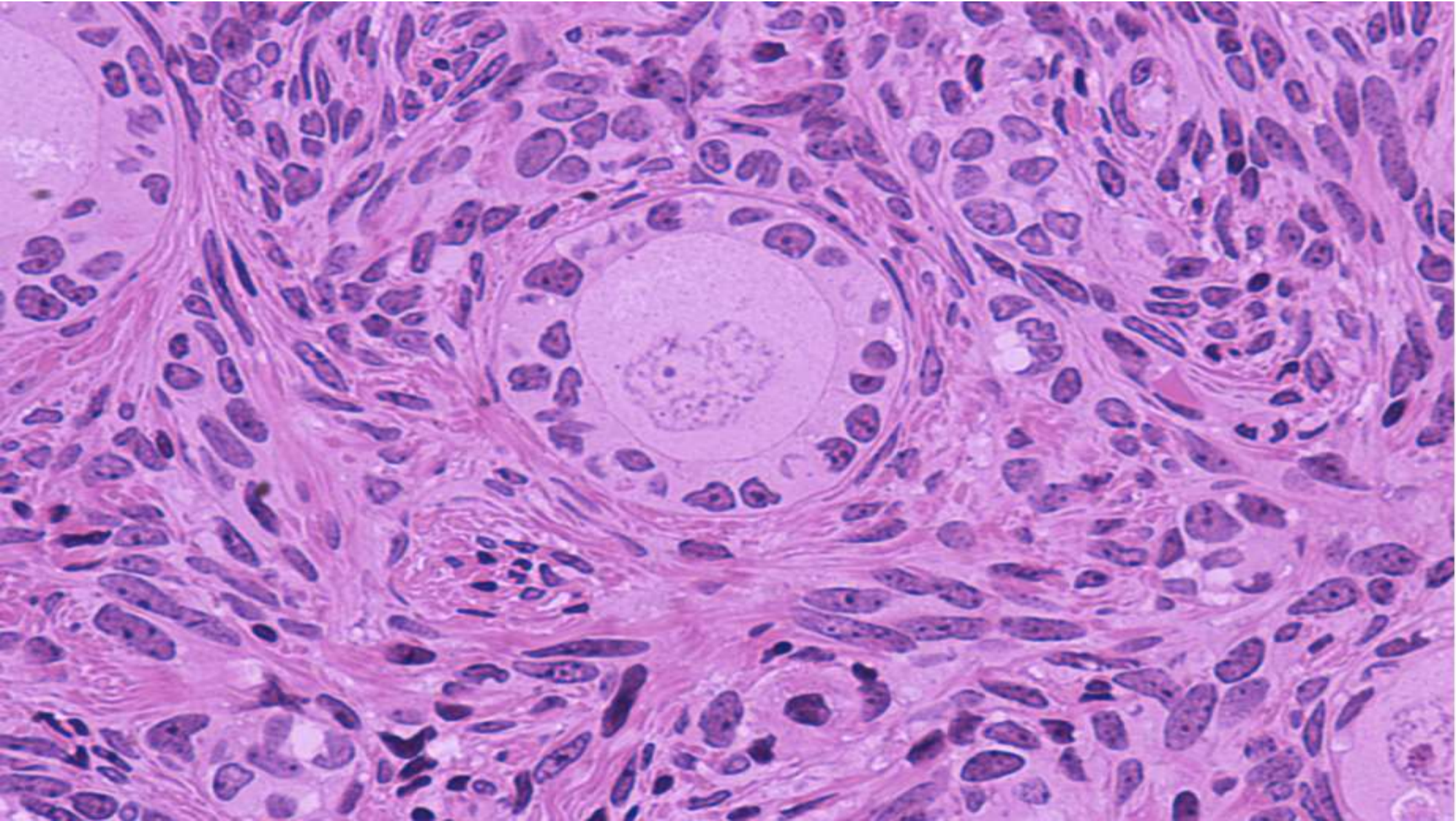


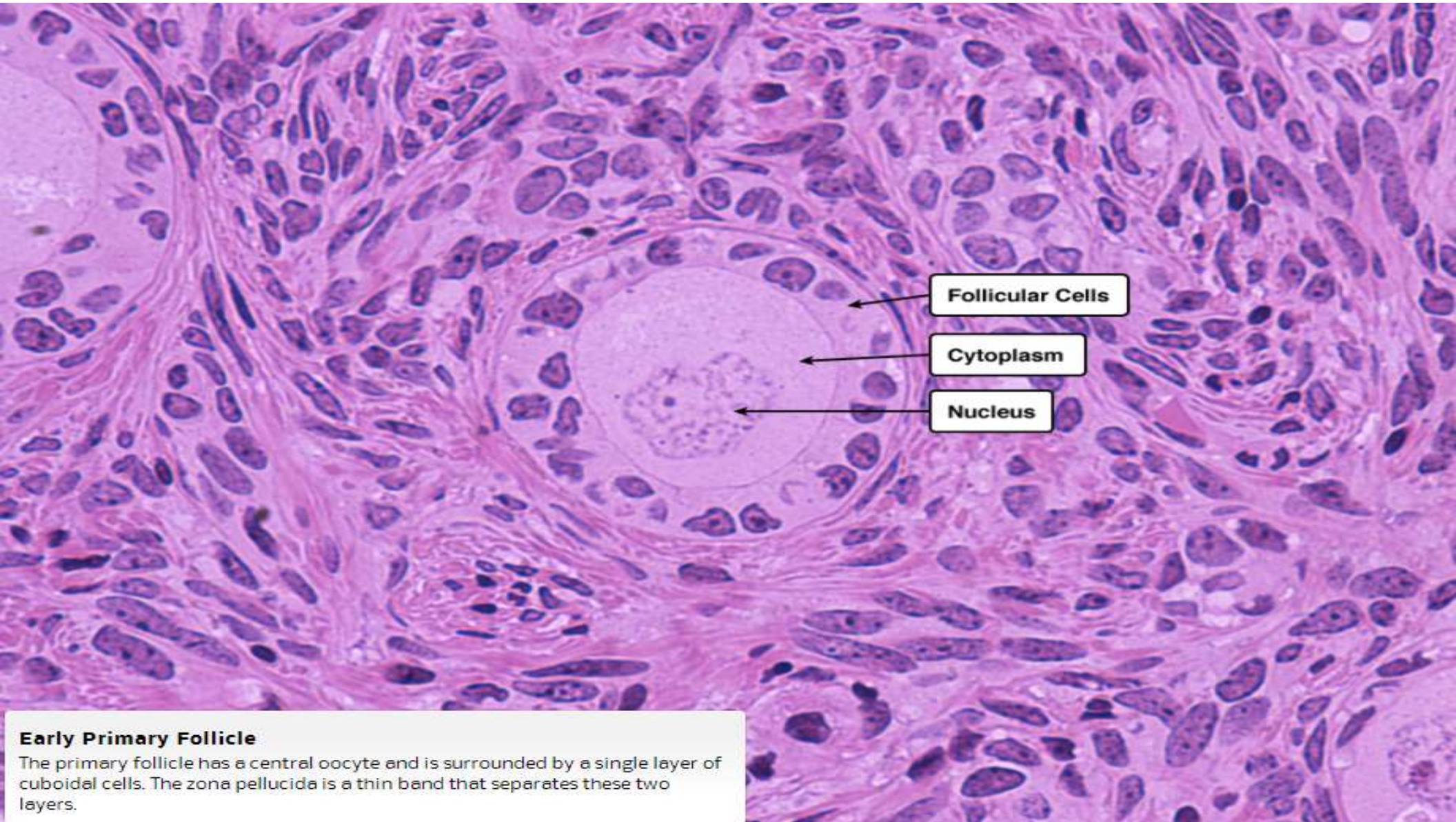




Secondary Follicle

The characteristic feature that distinguishes secondary from primary follicles is the appearance of a follicular antrum within the granulosa layer. This gap contains fluid known as liquor folliculi. Also visible in this image are the oocyte and the zona pellucida. The follicle is surrounded by the theca interna, whose cells produce hormones.





Follicular Cells

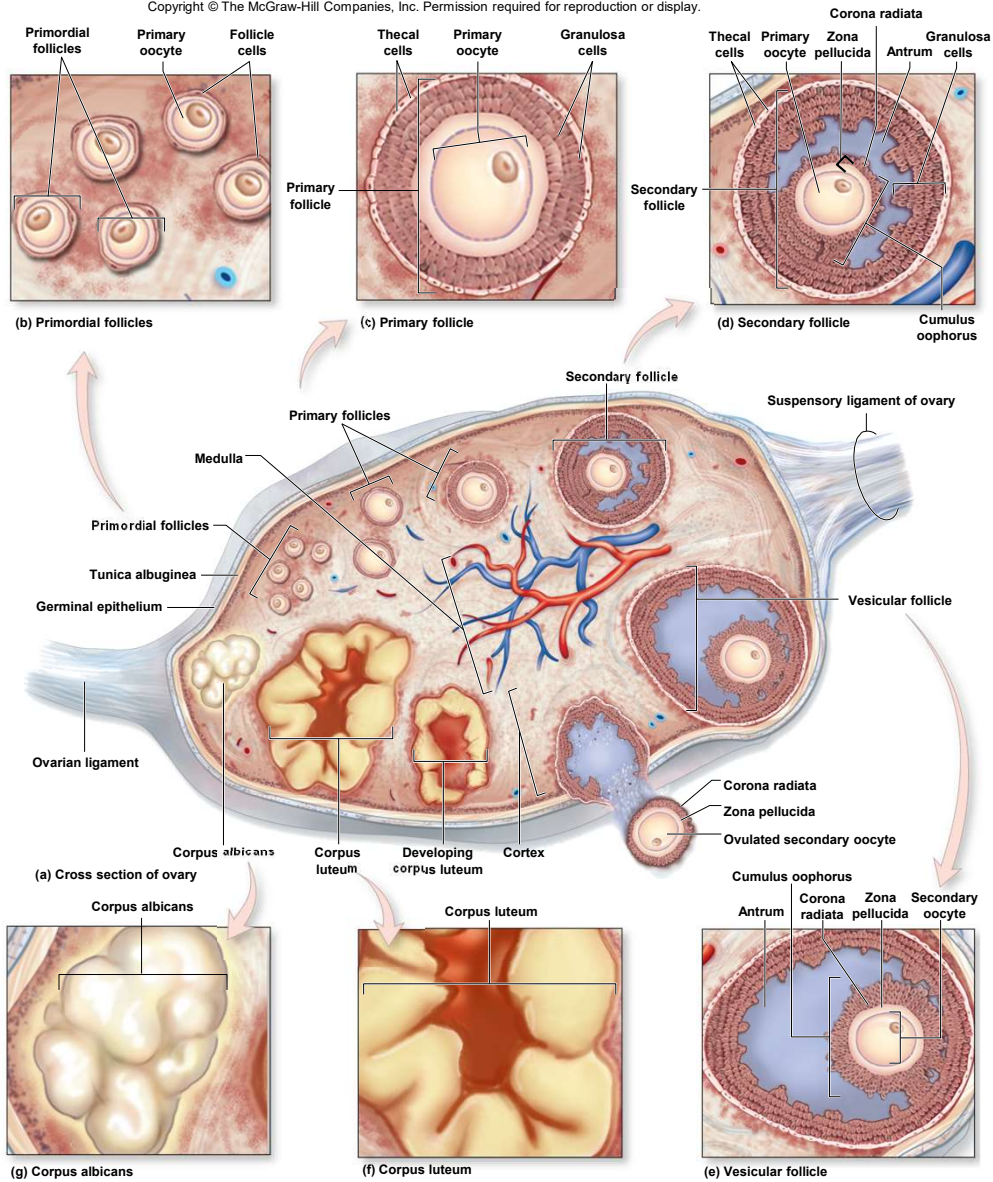
Cytoplasm

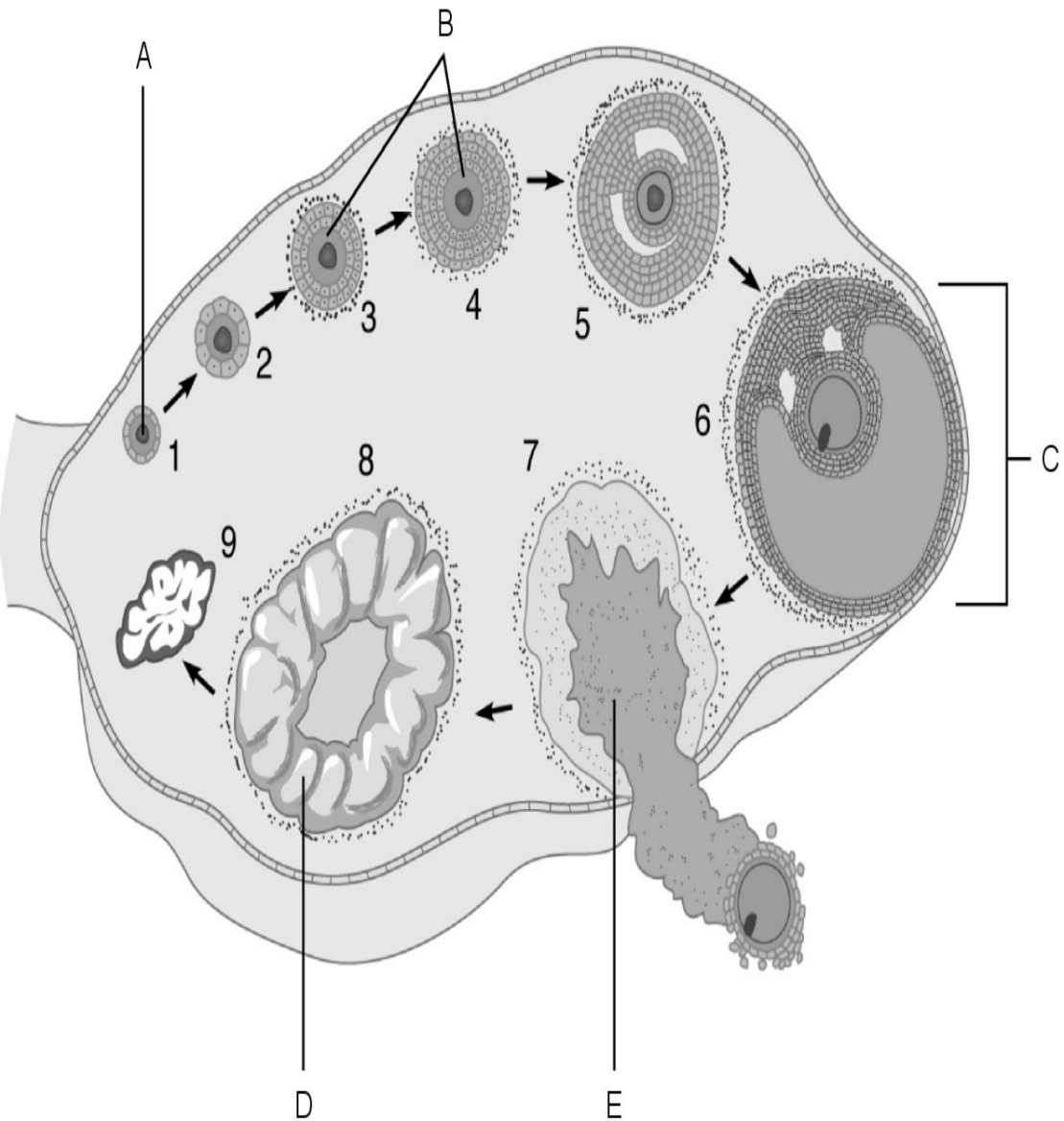
Nucleus

Early Primary Follicle

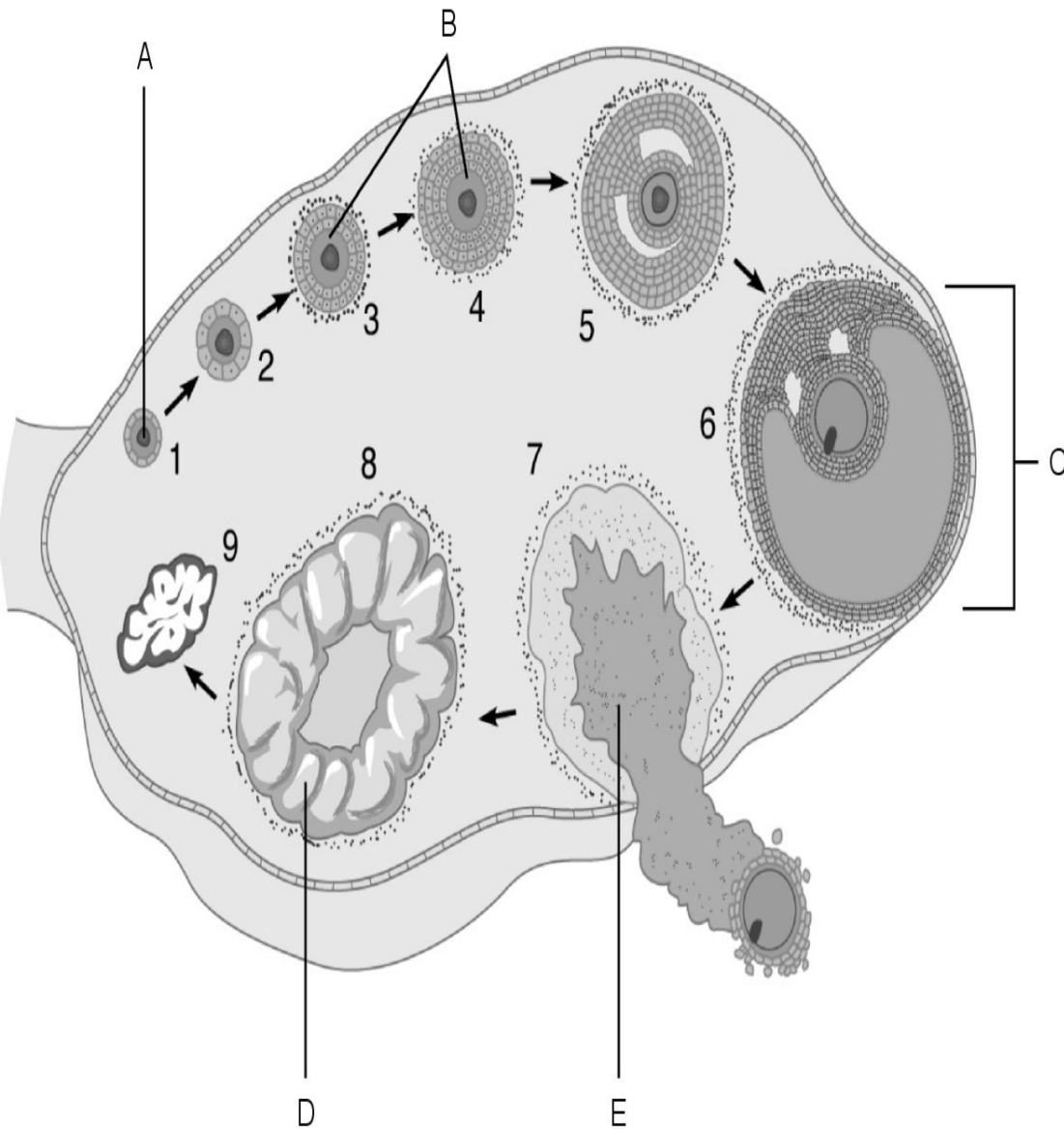
The primary follicle has a central oocyte and is surrounded by a single layer of cuboidal cells. The zona pellucida is a thin band that separates these two layers.

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- 63) The stage called ovulation.
- 64) Vesicular (Graafian) follicle.
- 65) Primary follicles.
- 66) Primordial follicle.



63) The stage called ovulation.

Answer: E

64) Vesicular (Graafian) follicle.

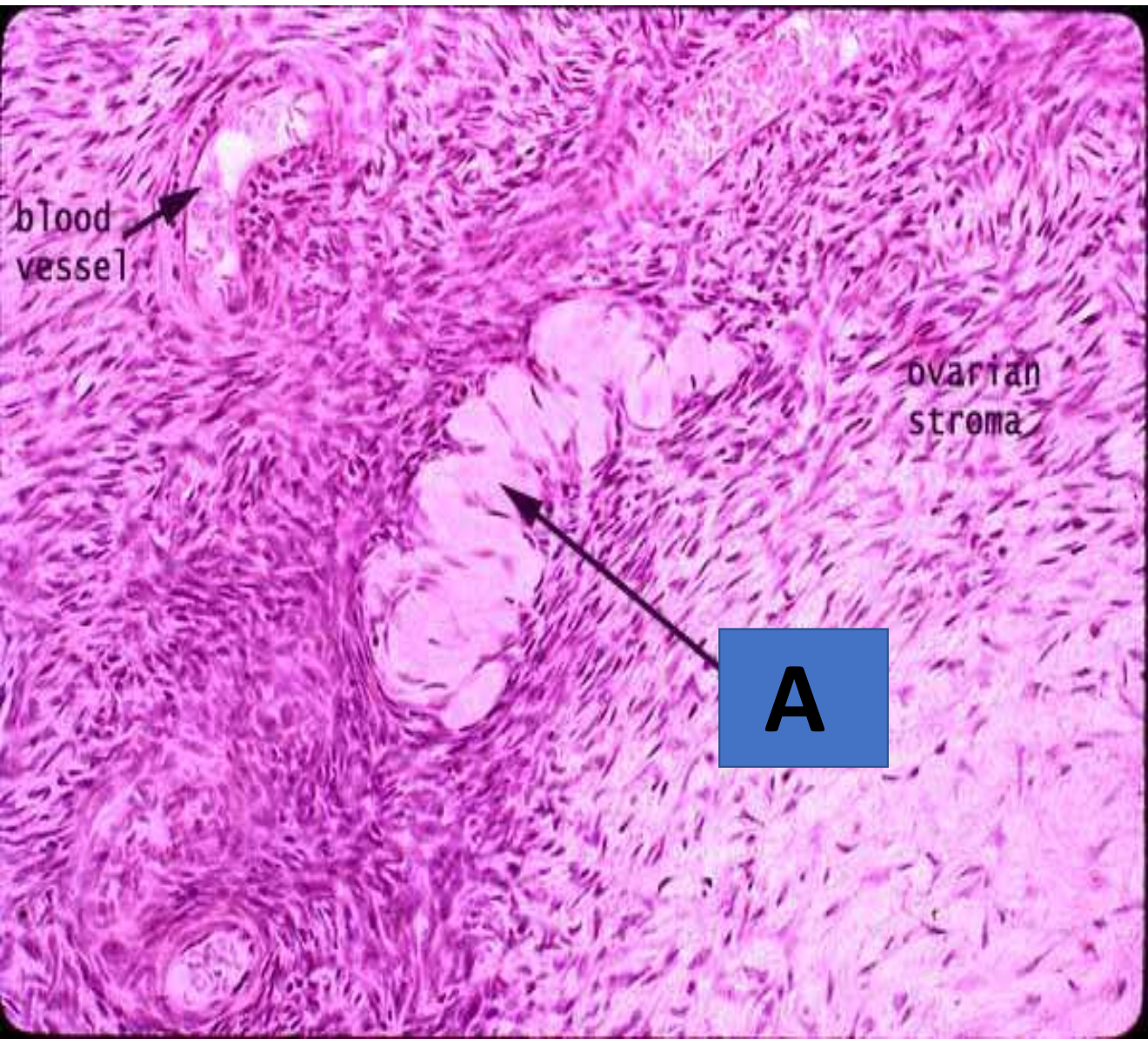
Answer: C

65) Primary follicles.

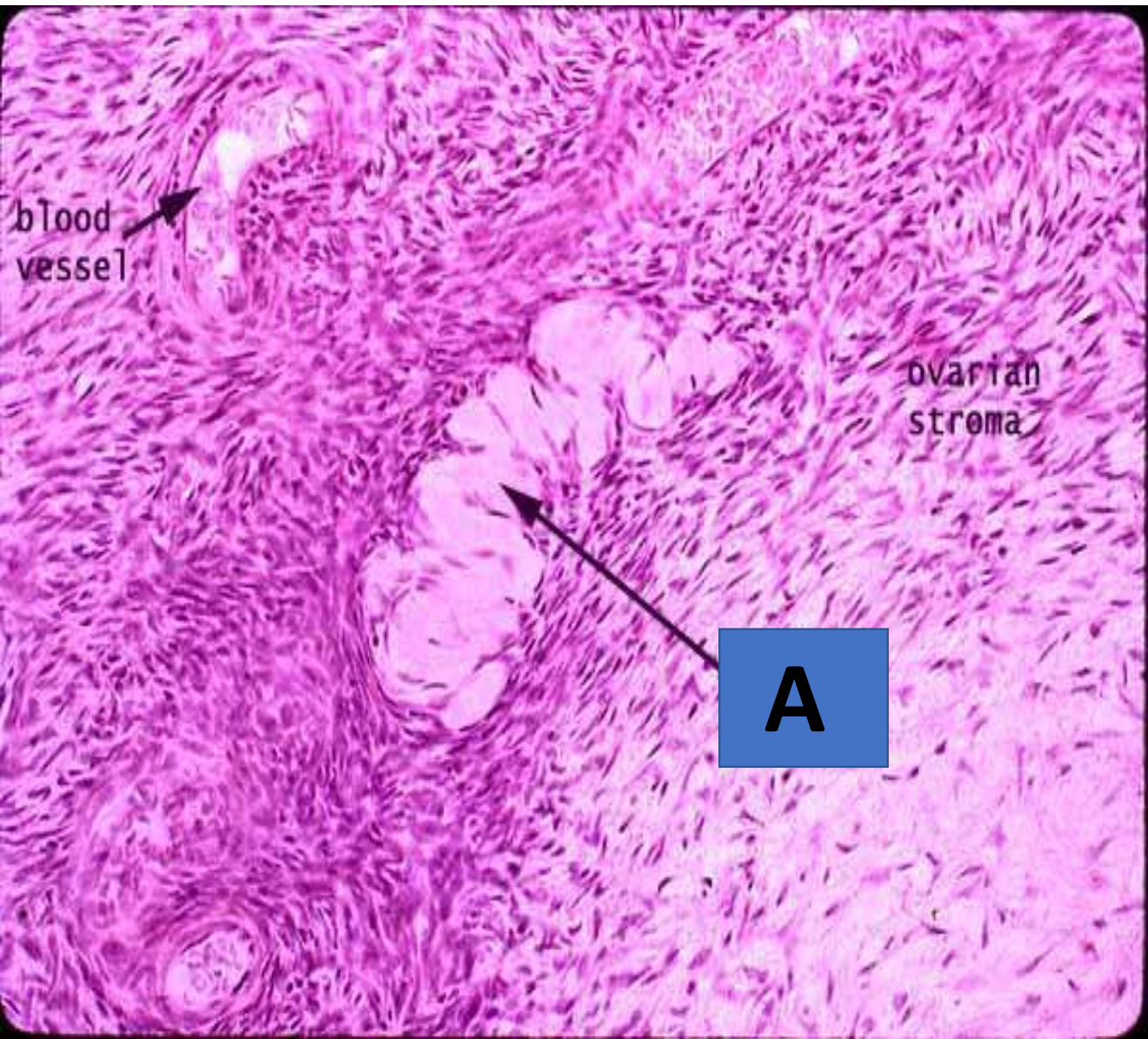
Answer: B

66) Primordial follicle.

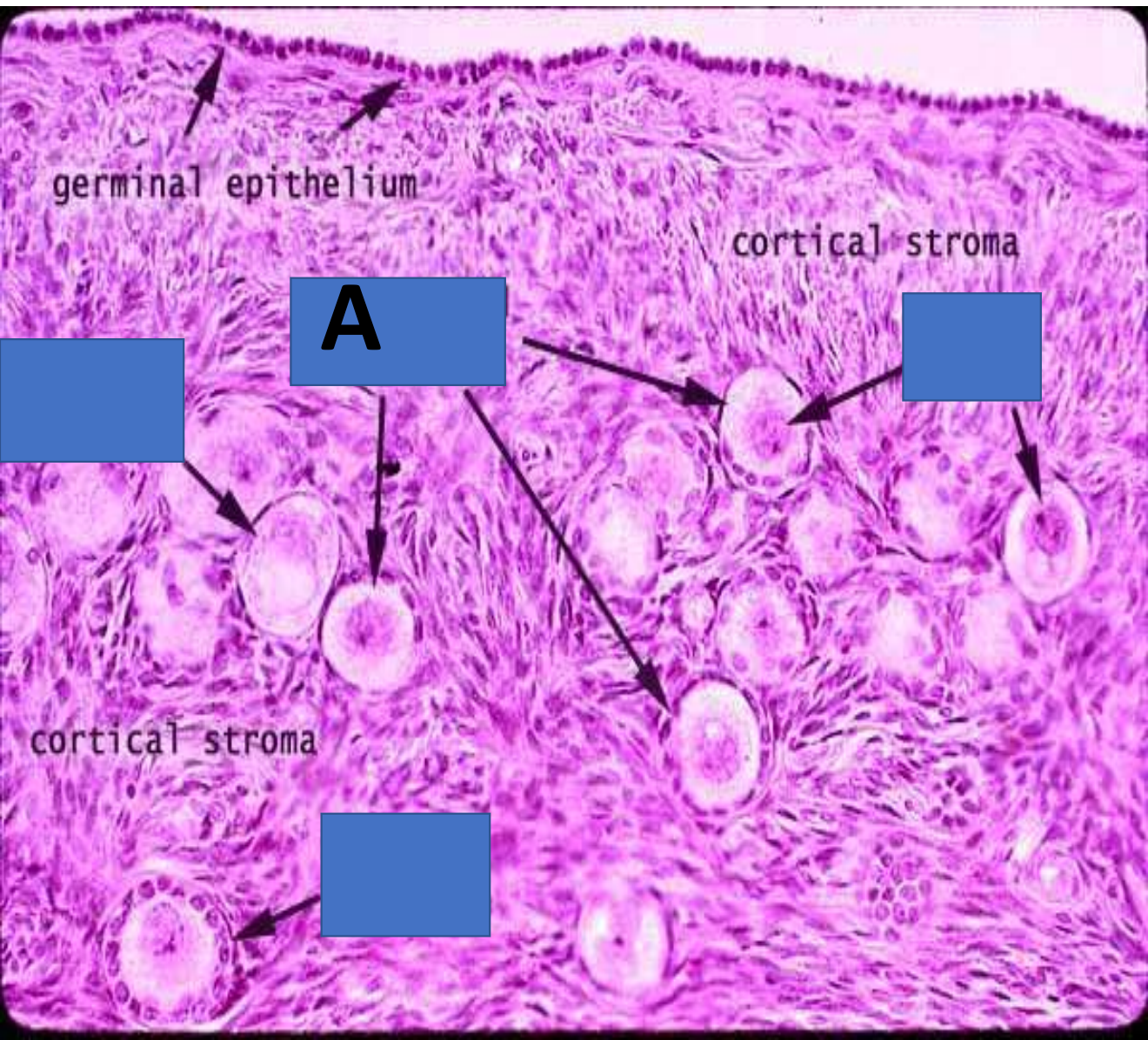
Answer: A



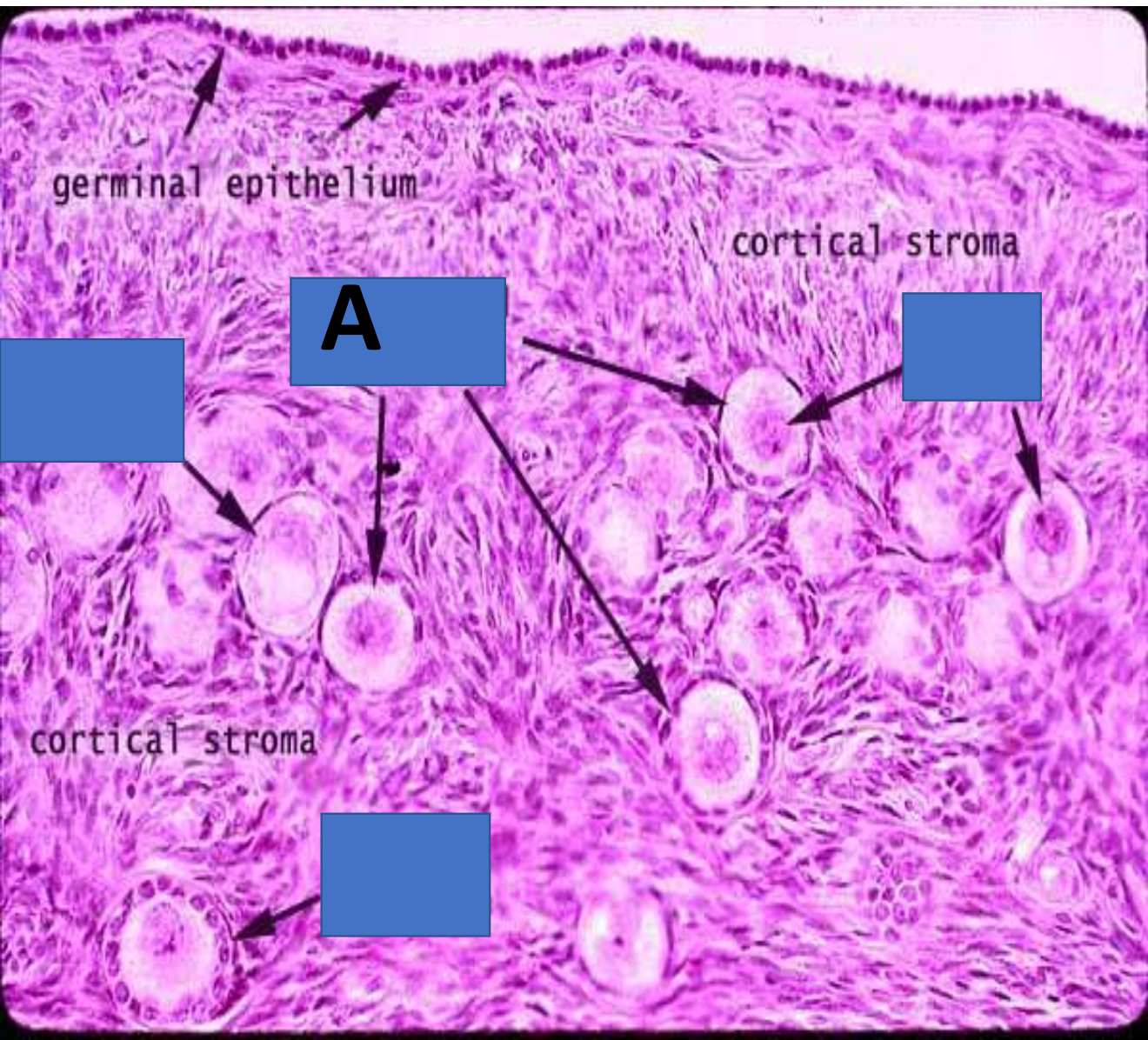
67/Identify structure A
A/CORPUS ALBICANS
B/CORPUS LUTEUM
C/CORPUS MAGELUM
D/GRAFIAN VESICLE
E/PRIMARY FOLLICLE



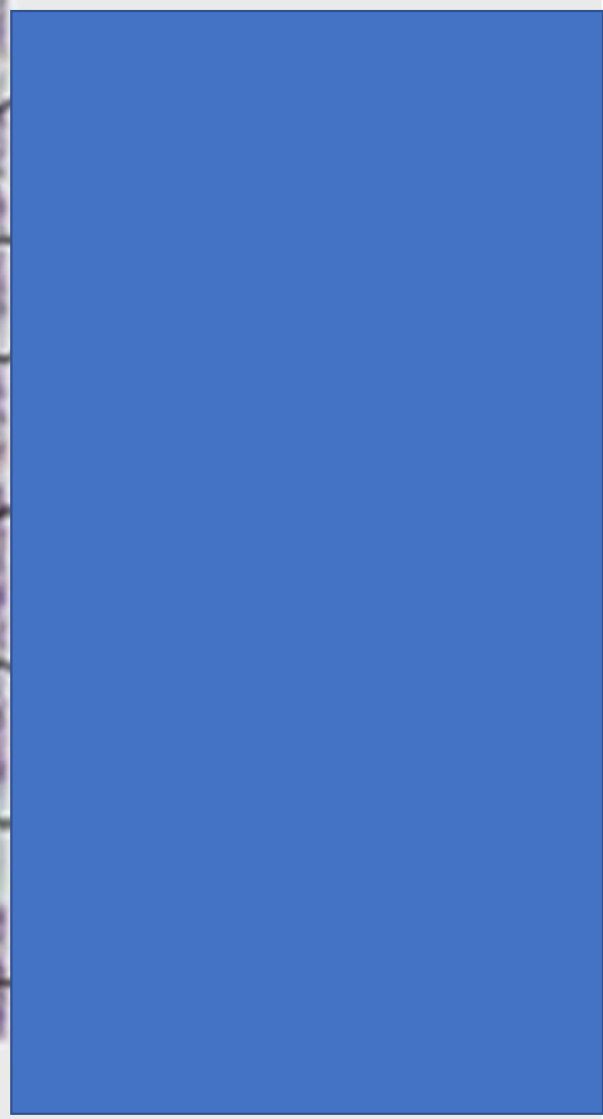
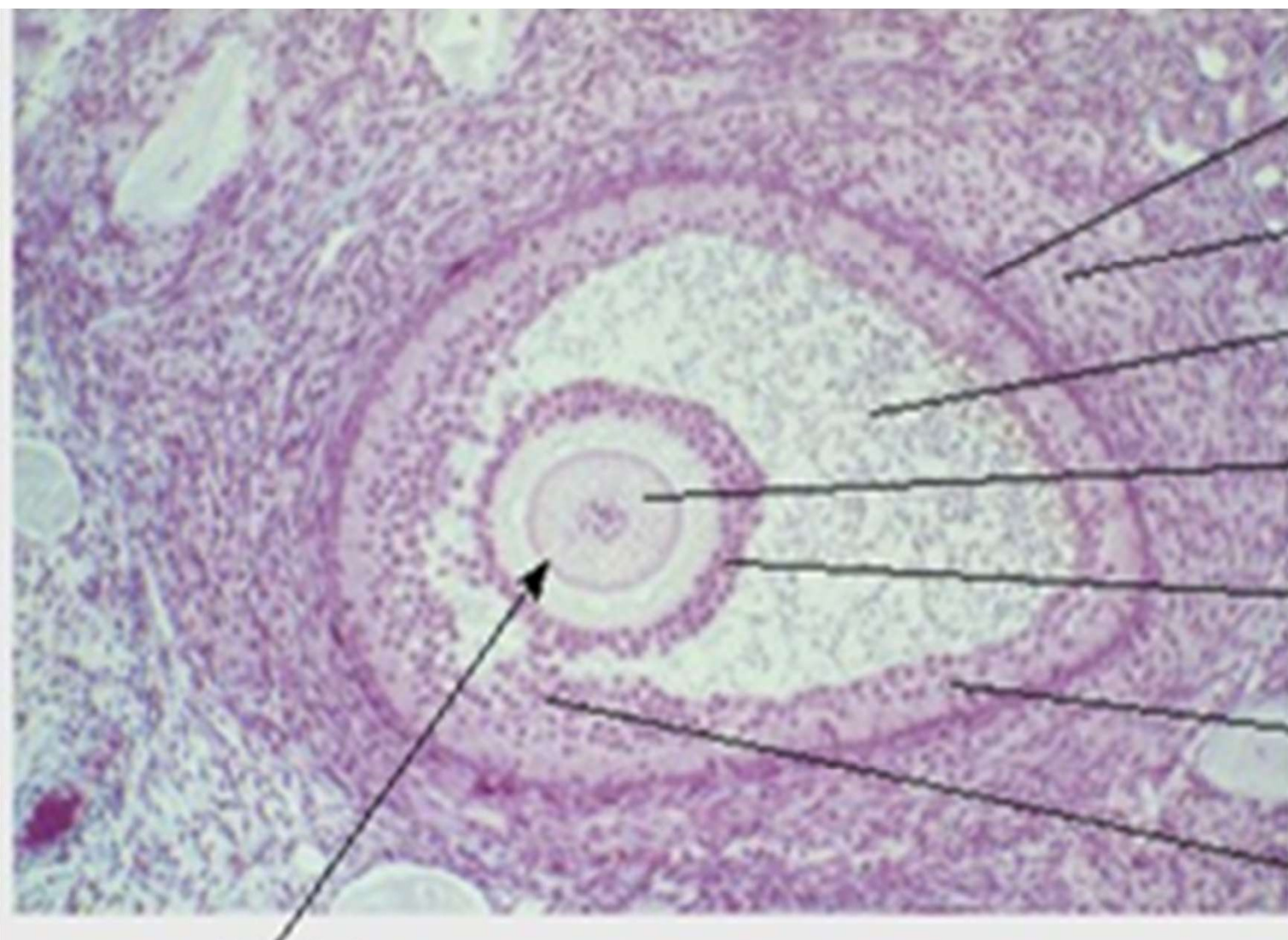
- 67/Identify structure A
- A/CORPUS ALBICANS
 - B/CORPUS LUTEUM
 - C/CORPUS MAGELUM
 - D/GRAFIAN VESICLE
 - E/PRIMARY FOLLICLE



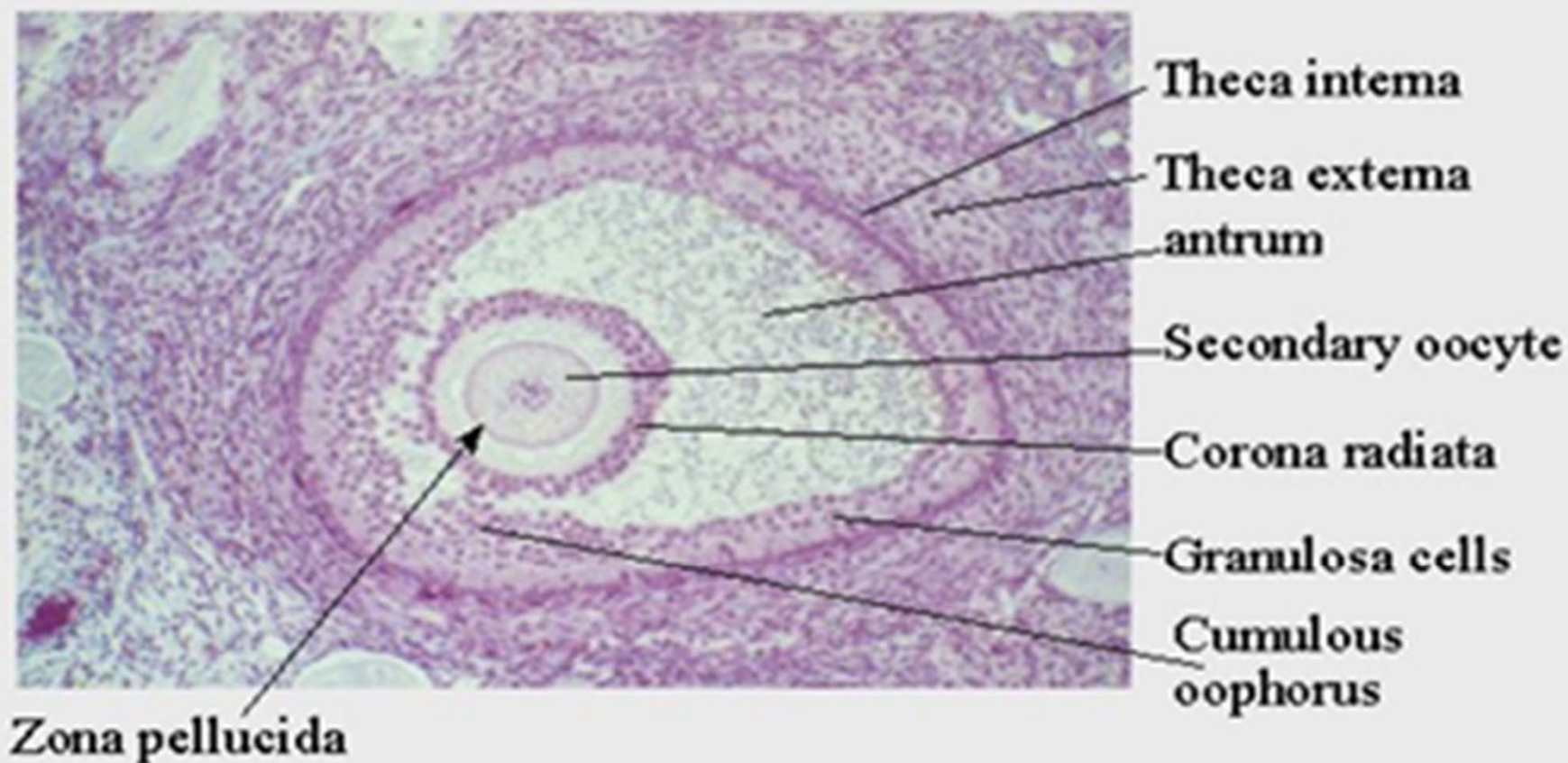
68/IDENTIFY A
A/SECONDARY FOLLICLES
B/PRIMARY FOLLICLE
C/TERTIARY FOLLICLES
D/ATRETIC FOLLICLE

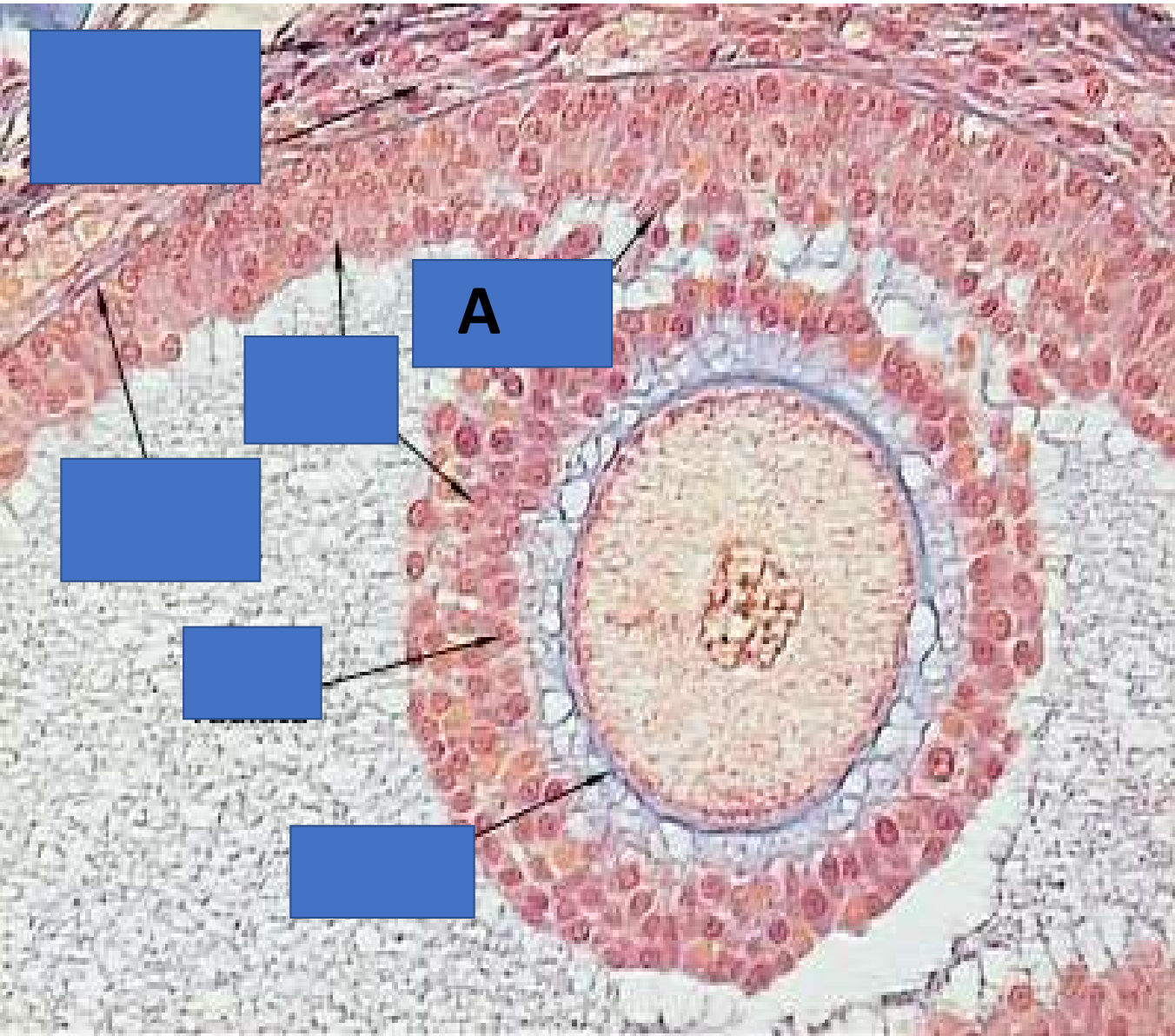


68/IDENTIFY A
A/SECONDARY FOLLICLES
B/PRIMARY FOLLICLE
C/TERTIARY FOLLICLES
D/ATRETIC FOLLICLE

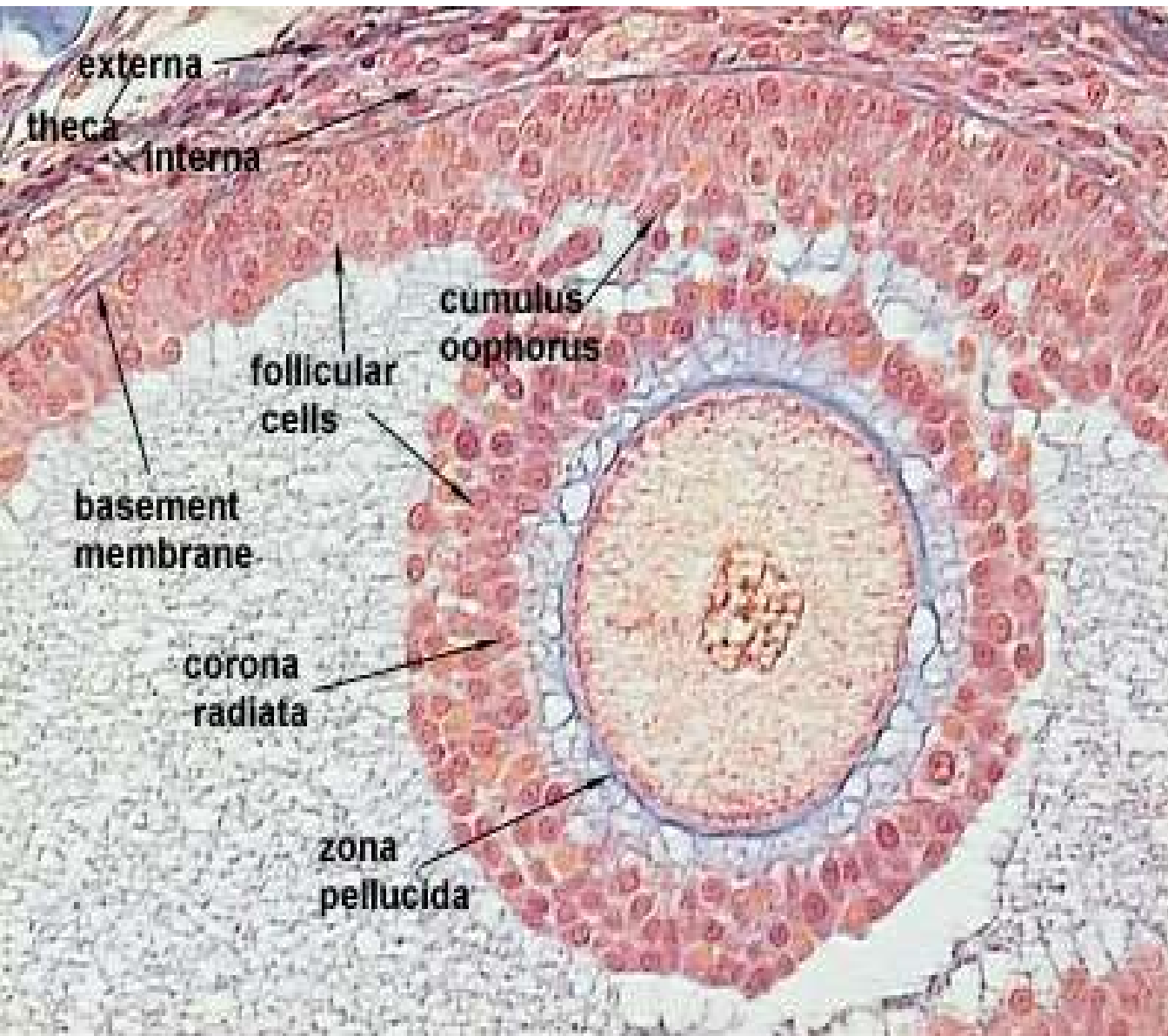


Mature (Vesicular) Follicle

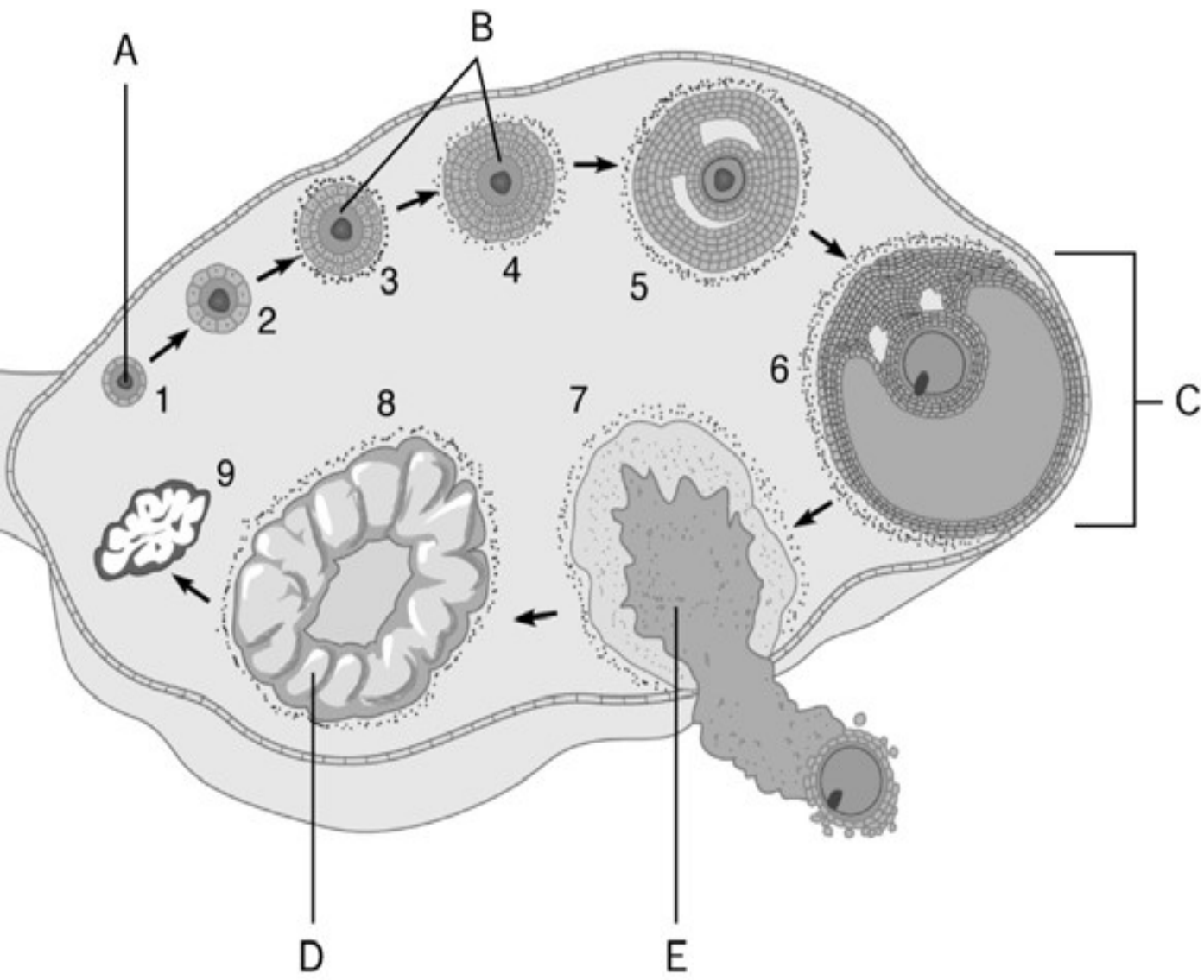




- /IDENTIFY A**
A/CORONARY RADIATA
B/CUMULUS OOPHORUS
C/OOCYTE
D/ZONA PELLUCIDA
E/GRANULOZA

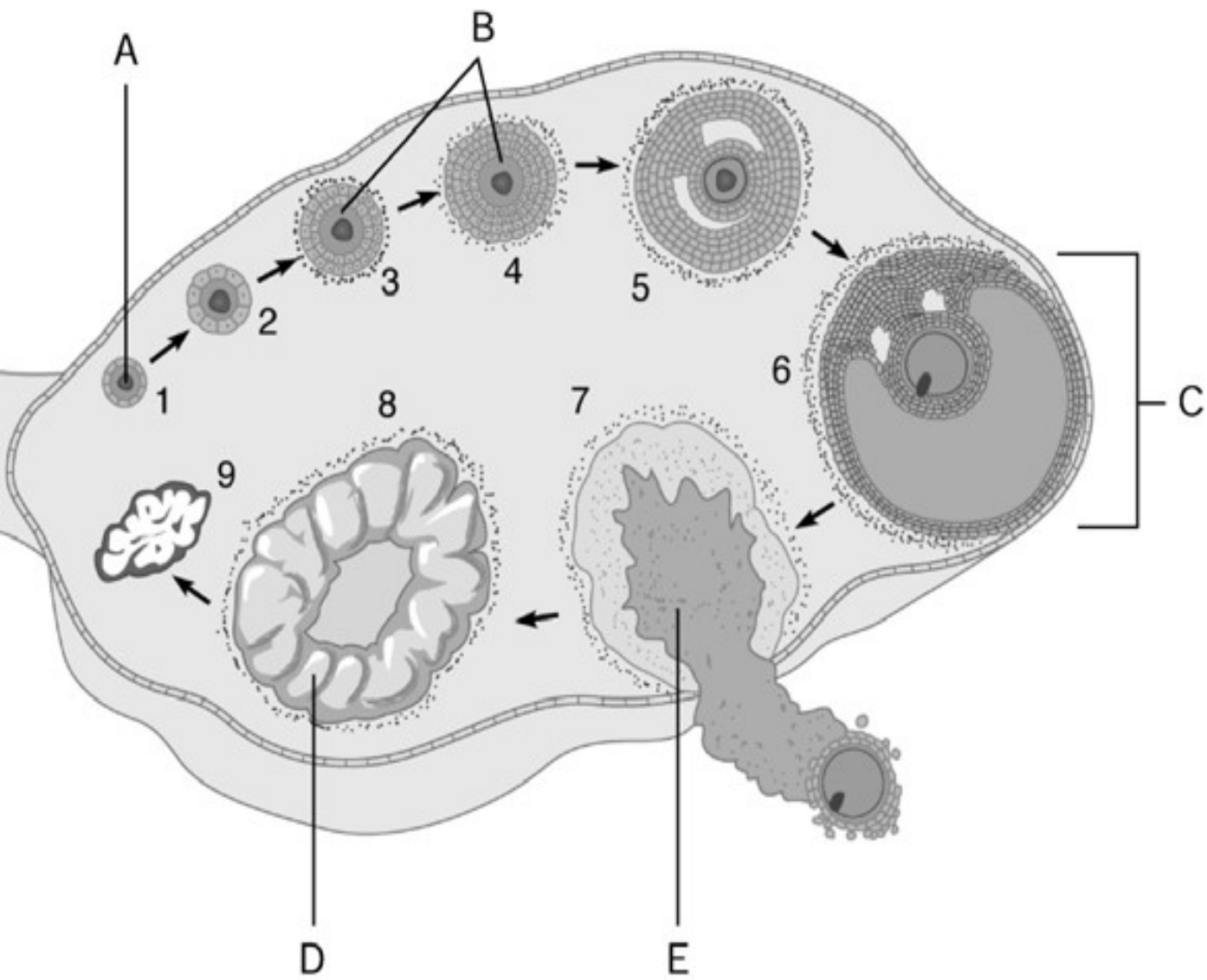


- /IDENTIFY A
- A/CORONARY RADIATA
- B/CUMULUS OOPHORUS**
- C/OOCYTE
- D/ZONA PELLUCIDA
- E/GRANULOZA



18) Graafian follicle.

19) Primordial follicle.

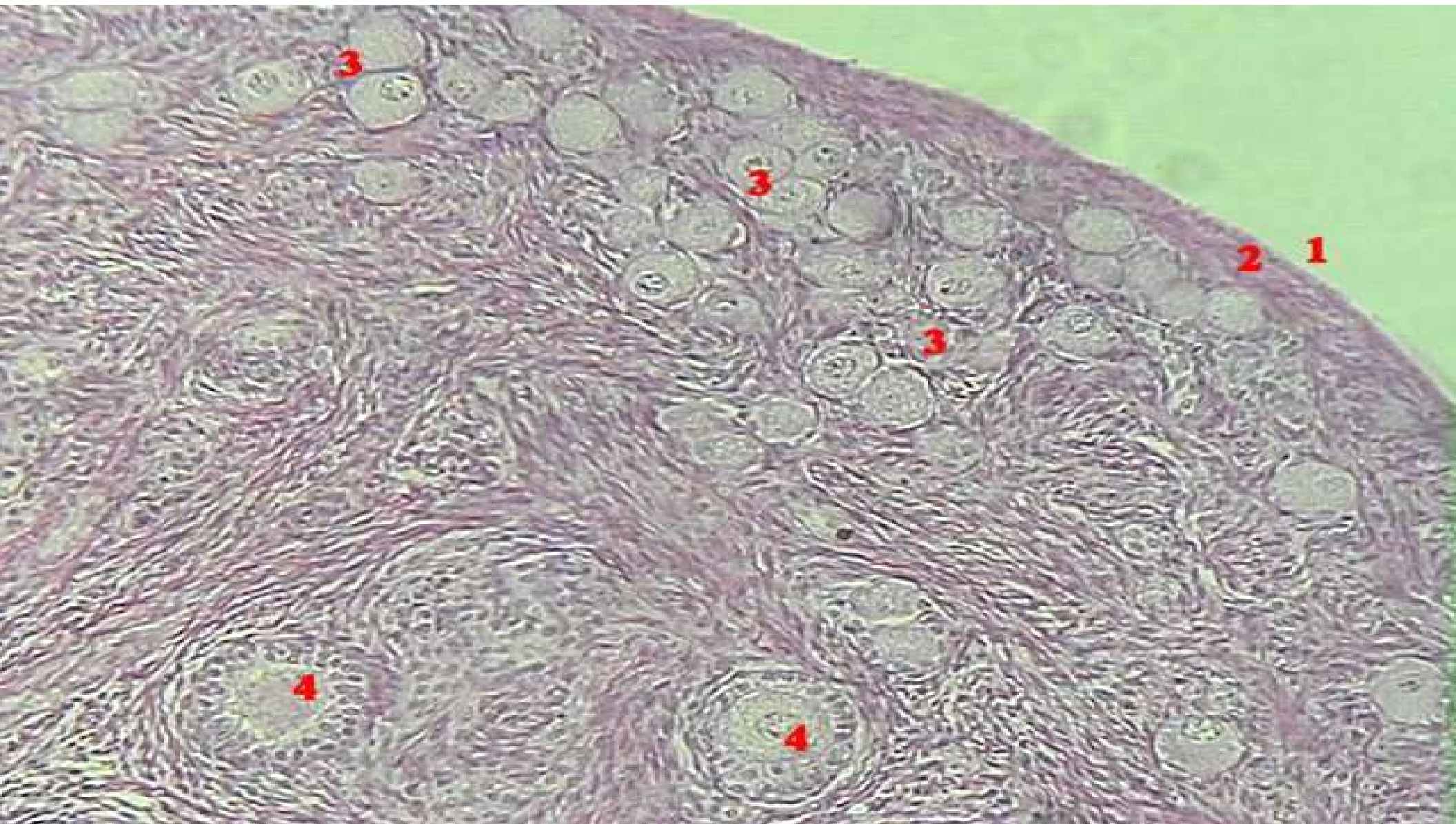


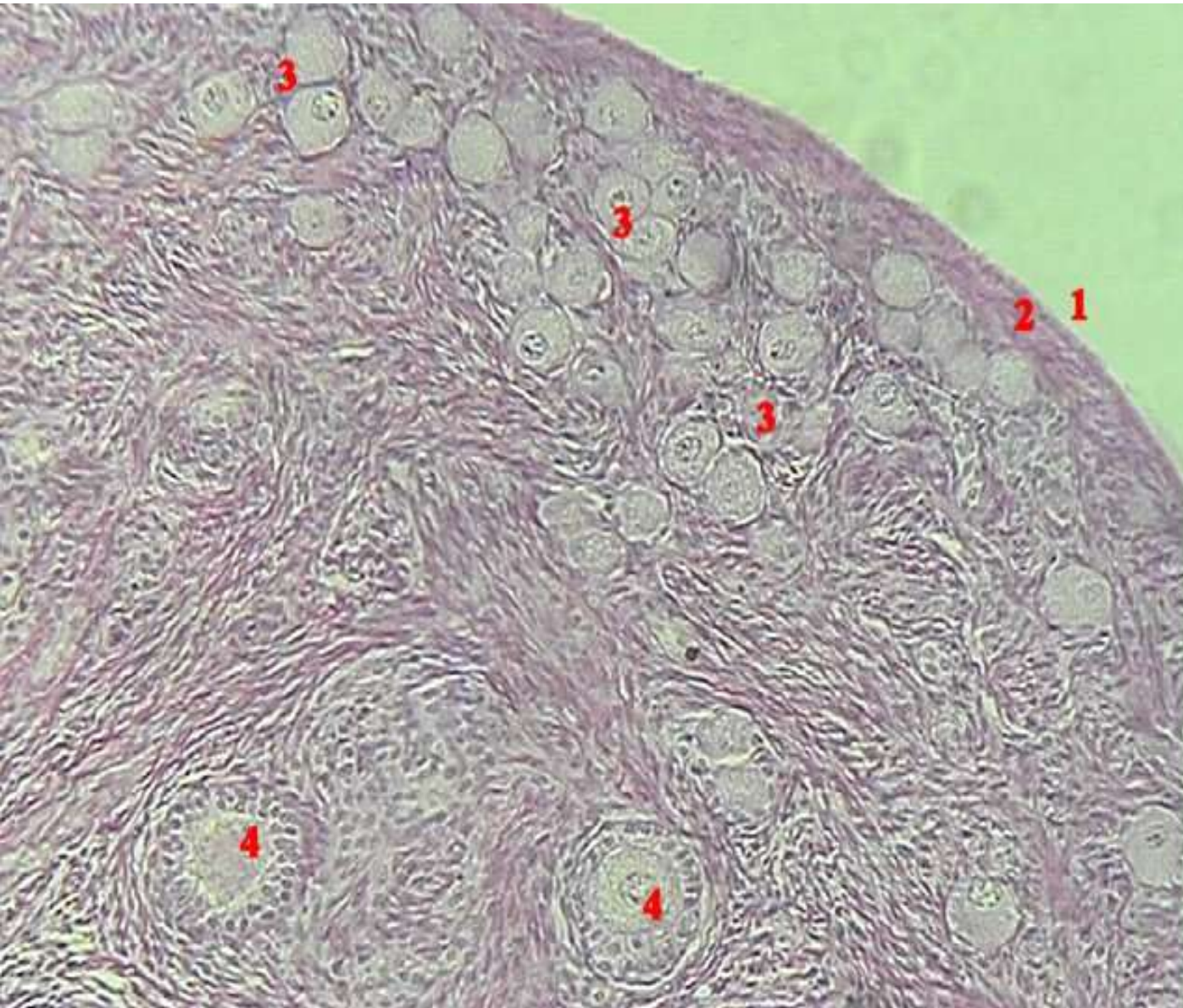
18) Graafian follicle.

Answer: C

19) Primordial follicle.

Answer: A





1. Germinal epithelium
2. Tunica albuginea
3. Primordial follicles
4. Primary follicles

Which of the following is found in the spermatic cord:

- a) Ductus deferens
- b) Dartos muscle
- c) Testicle
- d) Epididymis
- e) Bulbourethral gland



- a) ductus deferens

- What structure is superior to the urogenital diaphragm?
 - A) Bulbourethral glands
 - B) Bulb of the penis
 - C) Prostate gland
 - D) Membranous Urethra

-

- C) bulb of the penis

- The ovary is attached to?
 - a) Fimbriae
 - b) Mesosalpinx
 - c) Suspensory ligaments
 - d) Ampulla
 - e) Internal os

- c) Suspensory ligaments

- The primordial follicle secretes estrogen.
 - True
 - False

- False

- Every month, only one:
 - a) Primordial follicle is stimulated
 - b) Follicle secretes estrogen
 - c) Vesicular follicle undergoes ovulation
 - d) Ovary is stimulated
 - e) All of the above occur once every month

c) Vesicular follicle undergoes ovulation

- Mandy is 18 years old and typically has a 28-day cycle. Which of the following will be true on the 17th day of her cycle?
 - a)FSH levels are rising
 - b)Progesterone is being secreted
 - c)The ovary is in the ovulatory phase
 - d)The uterus is in the proliferative phase
 - e) The uterus is in the menstrual phase

b) Progesterone is being secreted

- A sudden decline in estrogen and progesterone levels ends inhibition of FSH release.
 - True
 - False

- True

- The muscular layer of the uterus is called the?
 - a) Epimetrium
 - b) Myometrium
 - c) Endometrium
 - d) Mucosa
 - e) None of the above

b) Myometrium

- Which of the following is a similarity between an ova and a sperm?
 - a) About the same number of each is produced per month
 - b) They have the same degree of motility
 - c) They are about the same size
 - d) Produced by the same organ
 - e) They have the same number of chromosomes

-

e) They have the same number of chromosomes

- Which of the following are correctly mismatched?
 - a) Testes – ovary
 - b) Labia majora – scrotum
 - c) Oviduct – ductus deferens
 - d) All of the above
 - e) None of the above

d)All of the above

- After ovulation, the ruptured follicle sloughs off as waste material:
 - True
 - False

- False

- Menstruation will result if:
 - a) Blood levels of FSH fall off
 - b) Blood levels of estrogen and progesterone decline
 - c) Blood levels of estrogen and progesterone increase
 - d) The corpus luteum secretes estrogen
 - e) None of the above

- b) Blood levels of estrogen and progesterone decline

- Testosterone is produced by:
 - a) Spermatoocytes
 - b) Spermatogonia
 - c) Sustentacular cells
 - d) Granulosa cells
 - e) None of the above

e)None of the above

- Normally, fertilization will occur in the?
 - a) Fallopian tubes
 - b) Ovary
 - c) Uterus
 - d) Vagina
 - e) Ductus deferens

a) Fallopian tubes

- During ovulation, the egg is released into:
 - a) Fallopian tube
 - b) Uterus
 - c) Vagina
 - d) Peritoneal cavity
 - e) More than one answer is correct

- d) Peritoneal cavity

- Which of the following plays a role in regulating the temperature around the testes?
 - a) Cremaster muscle
 - b) Dartos muscle
 - c) Bulbospongiosus
 - d) Ductus deferens
 - e) More than one answer is correct

-

e) More than one answer is correct

- The testes

- a) Develop within the scrotal cavity

- b) Produce sperm in the seminiferous tubule

- c) Contain sustentacular cells that produce testosterone

- d) Contain interstitial cells that maintain a blood-testes barrier

- E) Are enclosed in a mucous membrane called the tunica vaginalis

b) Produce sperm in the seminiferous tubule

- Which of the following organelles is the most prominent in the neck of a spermatozoa?
 - a) Centriole
 - b) Lysosomes
 - c) Mitochondria
 - d) Nucleus
 - e) None of the above

- c) Mitochondria

- Which of the following is not true about semen?
 - a) A man is probably infertile if his semen contains less than 20 million sperms/ml
 - b) It contains sperm and seminal fluid
 - c) It protects sperm from the hostile alkaline environment of the male urethra and female vagina
 - d) It contains an antibiotic called seminal plasmin
 - e) It provides sperm with a transportation medium and nutrients

-

c) It protects sperm from the hostile alkaline environment of the male urethra and female vagina

- Oogenesis is complete only after the secondary oocyte has been fertilized
 - True
 - False

- True

- Fibrous connective tissue that surrounds each kidney is the

A) cortex.

B) hilum.

C) medulla.

D) renal capsule.

E) renal pyramids.

- **D)** renal capsule.

- The apex of the renal pyramid is called the
 - A)** major calyx.
 - B)** minor calyx
 - C)** renal papilla.
 - D)** renal pelvis.
 - E)** ureter.

- **C)** renal papilla.

- The major calyces of the kidney converge to form an enlarged channel called the
 - A)** renal fascia.
 - B)** renal pelvis.
 - C)** renal pyramids.
 - D)** renal papillae.
 - E)** renal sinus.

- **B)** renal pelvis.

- The basic histological and functional unit of the kidney is the
 - A)** glomerulus.
 - B)** filtration membrane.
 - C)** nephron.
 - D)** podocyte.
 - E)** renal corpuscle.

- **C)** nephron.

Given these parts of a nephron:

1. renal corpuscle
2. collecting duct
3. loop of Henle
4. distal tubule
5. proximal tubule

Arrange the parts in order as fluid flows from the filtration membrane through the nephron.

- A) 1,5,3,4,2**
- B) 2,4,1,3,5**
- C) 2,1,4,5,3**
- D) 4,2,3,5,1**
- E) 5,1,3,4,2**

- **A)** 1,5,3,4,2

- The tuft of capillaries in the renal corpuscle is called the
 - A)** podocytes.
 - B)** glomerulus.
 - C)** calyx.
 - D)** renal pyramid.
 - E)** renal sinus.

- **B)** glomerulus.

- The juxtaglomerular apparatus is formed where the _____ projects between the afferent arteriole and efferent arteriole next to Bowman's capsule.
 - A) glomerulus
 - B) arcuate arteries
 - C) proximal tubule
 - D) distal tubule
 - E) collecting duct

- **D)** distal tubule

- Collectively, the capillary epithelium, basement membrane, and podocytes form the
 - A)** filtration membrane.
 - B)** glomerulus.
 - C)** juxtamedullary nephron.
 - D)** nephron.
 - E)** renal corpuscle.

- **A)** filtration membrane.

- The part of a nephron between Bowman's capsule and the Loop of Henle is the
 - A)**collecting duct.
 - B)** distal tubule.
 - C)** juxtaglomerular apparatus.
 - D)** macula densa.
 - E)** proximal tubule.

- **E)** proximal tubule.

- The _____ are specialized portions of the peritubular capillaries that extend deep into the medulla of the kidney.
 - A)** interlobar arteries
 - B)** arcuate arteries
 - C)** efferent arterioles
 - D)** afferent arterioles
 - E)** vasa recta

- **E)** vasa recta

- Given these vessels:

1. arcuate vein
2. afferent arteriole
3. efferent arteriole
4. interlobular vein
5. peritubular capillaries

Arrange the vessels in the order in which a drop of blood from the interlobular artery passes through them.

- A) 1,2,4,5,3**
- B) 2,3,5,4,1**
- C) 3,5,4,2,1**
- D) 4,2,5,3,1**
- E) 5,2,4,1,3**

- **B) 2,3,5,4,1**

- The triangular area of the urinary bladder between the two ureters posteriorly and the urethra anteriorly is the
 - A)** external urinary sphincter.
 - B)** internal urinary sphincter.
 - C)** smooth muscle.
 - D)** transitional epithelium.
 - E)** trigone.

- **E)** trigone.

- Skeletal muscle that surrounds the urethra as it extends through the pelvic floor is the
 - A)** external urinary sphincter.
 - B)** internal urinary sphincter.
 - C)** trigone.

- **A)** external urinary sphincter.

- Active transport of substances from the blood into the nephron is called
 - A)** filtration.
 - B)** tubular reabsorption.
 - C)** tubular secretion.

- **C)** tubular secretion.

- The movement of substances from the filtrate back into the blood of the peritubular capillaries is called
 - A)** filtration.
 - B)** tubular secretion.
 - C)** backflow.
 - D)** tubular reabsorption.
 - E)** micturition.

- **D)** tubular reabsorption.

- The part of the total cardiac output that passes through the kidneys is called the
 - A)** filtration fraction.
 - B)** plasma clearance.
 - C)** renal blood flow rate.
 - D)** renal fraction.
 - E)** tubular maximum.

- **D)** renal fraction.

- The part of the plasma volume that passes through the filtration membrane is the
 - A)** filtration fraction.
 - B)** plasma clearance.
 - C)** renal blood flow rate.
 - D)** renal fraction.
 - E)** tubular maximum.

- **A)** filtration fraction.

- Which of these substances normally cannot pass through the filtration membrane?
 - A) hemoglobin**
 - B) water**
 - C) sodium ions**
 - D) bicarbonate ions**
 - E) glucose**

- **A)** hemoglobin

- Of the filtrate that enters the nephron, about what percent is reabsorbed during urine formation?
 - A) 99%**
 - B) 95%**
 - C) 80%**
 - D) 65%**

- **A) 99%**

- A decrease in plasma proteins results in
 - A)** decreased colloid osmotic pressure.
 - B)** increased colloid osmotic pressure.
 - C)** increased glomerular capillary pressure.
 - D)** decreased filtration pressure.
 - E)** increased tubular reabsorption.

- A) decreased colloid osmotic pressure.

- As filtrate moves through the thin segment of the descending limb of the loop of Henle, water moves _____ the nephron, and solutes move _____ the nephron.
 - A)** into, into
 - B)** into, out of
 - C)** out of, into
 - D)** out of, out of

- **C)** out of, into

- During tubular reabsorption in the proximal tubule of the nephron, most solutes are moved across the apical membrane by _____ , and across the basal membrane by _____ .
 - A)** cotransport, cotransport
 - B)** cotransport, facilitated diffusion
 - C)** counter transport, cotransport
 - D)** facilitated diffusion, cotransport
 - E)** primary active transport, cotransport

- **B)** cotransport, facilitated diffusion

- In kidney nephron epithelial cells, solutes are cotransported with
 - A) Ca²⁺ ions.**
 - B) Cl⁻ ions.**
 - C) K⁺ ions.**
 - D) Mg²⁺ ions.**
 - E) Na⁺ ions.**

- E) Na⁺ ions.

- In kidney nephron epithelial cells, _____ are moved by counter transport through the basal membrane in exchange for K^+ ions.
 - A) Ca^{2+} ions
 - B) Cl^- ions
 - C) H^+ ions
 - D) Mg^{2+} ions
 - E) Na^+ ions

- **E)** Na⁺ ions

- The ascending limb of the loop of Henle is _____ to water.
 - A)** impermeable
 - B)** moderately permeable
 - C)** permeable

- **A)** impermeable

- The percentage of filtrate volume reabsorbed in the proximal tubule is
 - A) 99%.**
 - B) 80%.**
 - C) 65%.**
 - D) 19%.**
 - E) 15%.**

- **C) 65%.**

- These ions are cotransported across the apical membrane in the ascending limb of the loop of Henle.
 - A)** K⁺ ions and Cl⁻ ions
 - B)** K⁺ ions and Mg²⁺ ions
 - C)** Ca²⁺ ions and K⁺ ions
 - D)** Ca²⁺ ions and Cl⁻ ions
 - E)** Ca²⁺ ions and Mg²⁺ ions

- **A)** K⁺ ions and Cl⁻ ions

- The permeability of the distal tubule and the collecting duct is controlled by
 - A) ADH.**
 - B) aldosterone.**
 - C) atrial natriuretic factor.**
 - D) carrier molecules.**
 - E) sodium ions.**

- **A)** ADH.

- All of these compounds are reabsorbed from the filtrate back into the blood EXCEPT
 - A) amino acids.
 - B) fructose.
 - C) Na⁺ ions.
 - D) penicillin.
 - E) Ca²⁺ ions.

- **D)** penicillin.

- At which of these locations is the osmolality of the filtrate the highest?
 - A)** Bowman's capsule
 - B)** proximal tubule
 - C)** bottom of the loop of Henle
 - D)** distal tubule
 - E)** top of the collecting duct

- **C)** bottom of the loop of Henle

- Renal tubules are _____ permeable to urea than they are to water, therefore urea concentration in the tubules _____ .
 - A)** less, decreases
 - B)** less, increases
 - C)** more, decreases
 - D)** more, increases

- **B)** less, increases

- Which of these substances is actively transported into the filtrate in the proximal and distal tubule?
 - A) H⁺ ions
 - B) Na⁺ ions
 - C) glucose
 - D) amino acids
 - E) Cl⁻ ions

- **A)** H⁺ ions

- The countercurrent multiplier mechanism of the nephron is in the
 - A)** proximal tubule and distal tubule.
 - B)** Loop of Henle and vasa recta.
 - C)** distal tubule and collecting duct.
 - D)** glomerulus and Bowman's capsule.
 - E)** glomerulus and collecting duct.

- **B)** Loop of Henle and vasa recta.

- Urea diffuses out of the _____ , and into the _____ .
 - A)** proximal tubule, distal tubule
 - B)** proximal tubule, descending limb of the Loop of Henle
 - C)** descending limb of the Loop of Henle, ascending limb of the Loop of Henle
 - D)** ascending limb of the Loop of Henle, descending limb of the Loop of Henle
 - E)** collecting duct, descending limb of the Loop of Henle

- **E)** collecting duct, descending limb of the Loop of Henle

- Juxtaglomerular cells secrete

- A) ADH.**

- B) oxytocin.**

- C) renin.**

- D) aldosterone.**

- E) angiotensin**

- **C)** renin.

- Drinking a large amount of beer results in
 - A)** increased aldosterone secretion.
 - B)** increased permeability of the collecting ducts of the nephrons.
 - C)** decreased urine osmolality.
 - D)** increased urine volume.
 - E)** both c and d

- **E)** both c and d

- Which of these conditions increases the amount of urine produced?
- **A)** increased ADH secretion
- **B)** increased atrial natriuretic hormone secretion
- **C)** increased aldosterone secretion
- **D)** decreased blood pressure in the glomerular capillaries
- **E)** sympathetic stimulation of the renal arteries

- **B)** increased atrial natriuretic hormone secretion

- Angiotensin II causes
 - A)** increased ADH secretion.
 - B)** increased thirst.
 - C)** increased salt appetite.
 - D)** increased peripheral resistance.
 - E)** all of these

- **E)** all o f these

- When the tubular load of a substance exceeds the tubular maximum, that substance will
 - A)** be actively transported into the blood.
 - B)** diffuse into the blood.
 - C)** appear in the urine.
 - D)** cause a backflow of filtrate from Bowman's capsule into the glomerulus.
 - E)** be broken down by carbonic anhydrase.

- **C)** appear in the urine.

- The micturition reflex
 - A)** can be stimulated or inhibited by higher centers in the brain.
 - B)** is stimulated by increased pressure in the bladder.
 - C)** can be stimulated by irritation of the bladder or urethra.
 - D)** all of these

- **D)** all of these

What are the 3 parts of the male urethra?

Prostatic, membranous, spongy

The nephron consists of:

Renal corpuscle, proximal convoluted tubule, Loop of Henle, distal convoluted tubule, collecting duct

What is the GRF?

Glomerular Filtration Rate

(The amount of filtrate produced in the kidneys each minute.)

What does the GFR produce?

Renin and erythropoietin

What are the 2 types of muscle around testes?

Dartos and cremaster

What are the male accessory organs?

Seminal vesicles, prostate gland, bulbourethral glands, scrotal sac, penis

The testes are formed in the _____ and descend into the scrotum at _____.

Abdomen; 28 weeks

What are the 3 phases of spermatogenesis?

Spermatogonial phase (mitosis), spermatocyte phase (meiosis), & spermatid phase

What are the 3 materials produced by seminal vesicles?

Fructose, prostaglandins, & fibrinogen

In the female, what are the two types of cysts?

Functional (shrinks after cycle);
pathological (increases or stays the same
size)

Human fertilization normally takes place in the _____.

Fallopian tubes

What structure does the term
fimbriated refer to?

Uterine (fallopian) tube

What is the pathway of urine flow in the kidney?

Renal cortex, renal pyramid, renal papilla, minor calyx,
renal pelvis, ureter

How many pyramids are normally in the medulla?

Normally 8, but you can have
between 7-12.