VISIBLE BODY®

The Reproductive System: Female Anatomy

A reproductive system lab activity using Visible Body Suite

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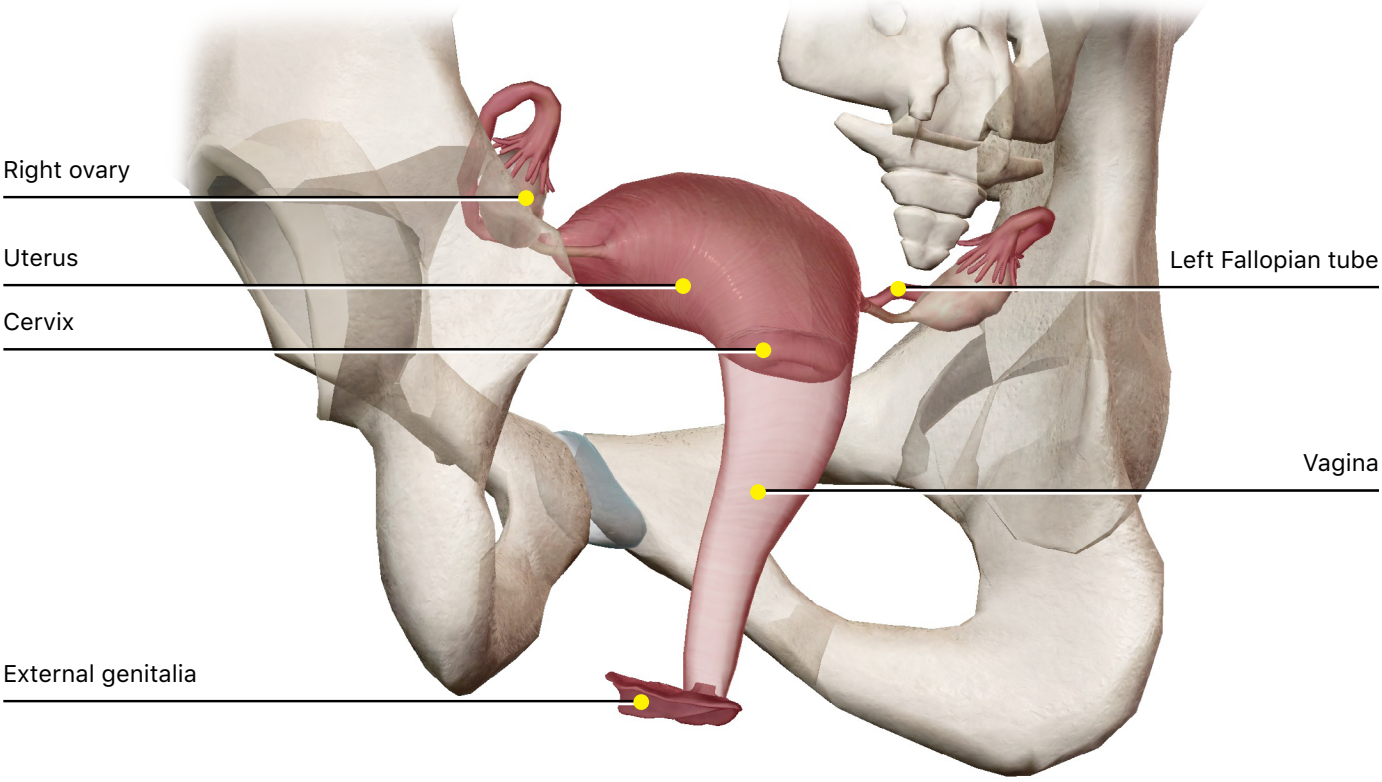
PRE-LAB EXERCISES

A. Open Visible Body Suite. From the main menu, choose Anatomy & Physiology and select 12. Reproductive System. Go to Module 47.3 Female Reproductive Anatomy.



Internal female reproductive anatomy consists of glands that produce ova (unfertilized eggs) and hormones, and structures that support the developing embryo. Using the list in Module 47.3, find the internal female reproductive structures by selecting the following terms. Read the definitions for each structure by choosing the book icon at the top, and answer the following questions:

1. **Ovaries**.

    a. What kind of gametes are produced by ovaries?

    b. Female gametes contribute _____ the genetic instructions necessary for the development of an embryo after fertilization.

    c. Ovaries produce the endocrine hormones _____ and _____.

    d. Ovum is a term for an unfertilized egg. The plural of ovum is _____.

e. An unfertilized egg is released from an ovary by a process called _____.

f. After leaving the ovary, the egg enters the _____ tube.

2. **Uterine tubes**.

a. Each uterine tube consists of three coats: an external _____ coat, a middle _____ coat, and an internal _____ coat.

b. The uterine tubes are divided into three sections: the _____, which connects to, and is continuous with, the uterus; the _____, which curves over the ovary; and the _____, which is open to the abdomen and surrounds the ovary.

c. The finger-like projections of the uterine tube that extend over the ovary are called _____.

d. Fertilization (the fusion of egg and sperm) usually occurs in the _____ of the uterine tube.

3. **Uterus**.

a. Fertilized eggs that reach the uterus embed (implant) in the uterine _____ and remain there, throughout development, as an embryo and then a fetus, until birth.

4. **Cervix**.

a. The cervix connects the uterus to the vagina and serves as a passageway for _____, _____, and _____.

5. **Vagina**.

a. The vagina extends from the cervix to the vestibule (the external opening of the female reproductive tract). The vaginal wall consists of layers of muscle and is lined with a _____ membrane.

b. The vagina carries menstrual flow outside the body, receives the male penis during intercourse, and serves as the _____ during labor.

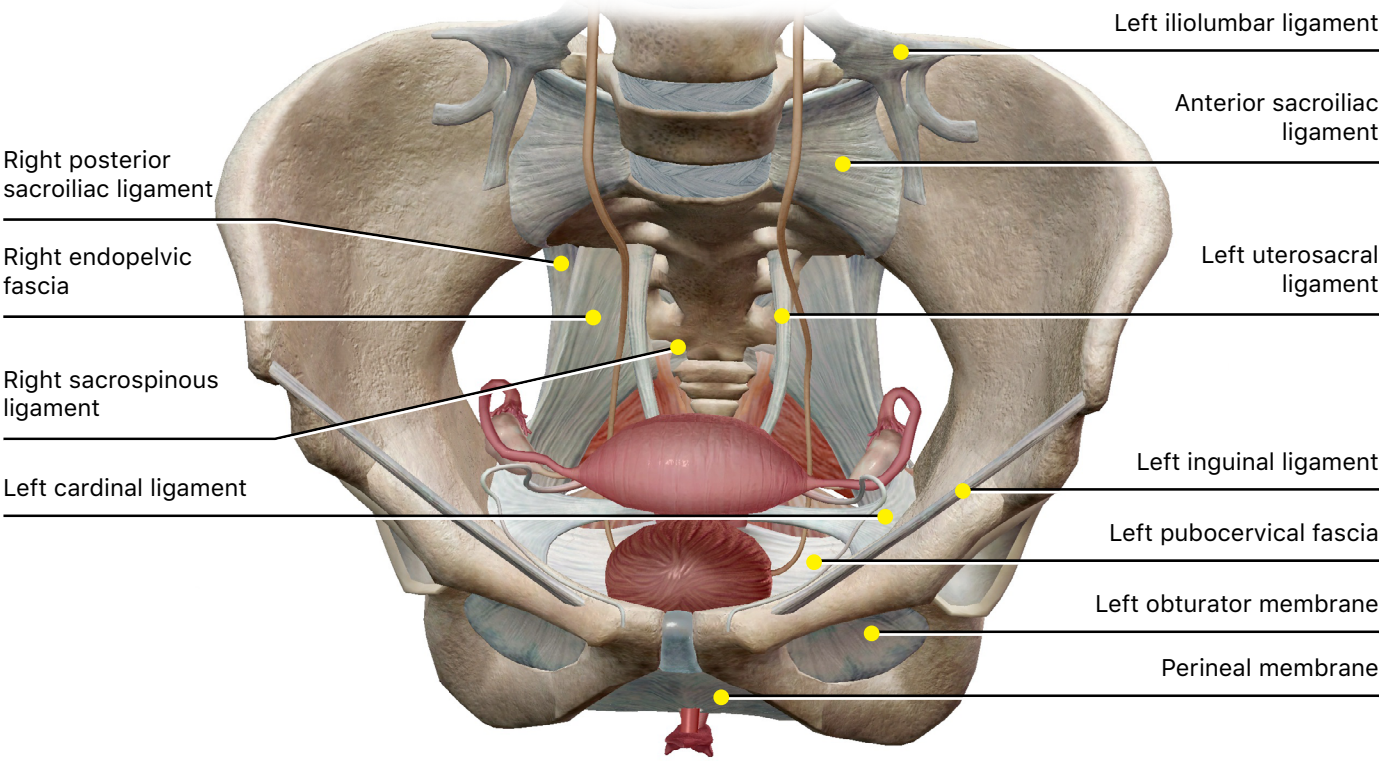
6. Select **External genitalia** and note where the vagina opens to the outside.

IN-LAB EXERCISES

Use the following modules in the Anatomy & Physiology section of Visible Body Suite to guide your exploration of the reproductive system. You can manipulate the images to see different views and isolate each structure. Be sure to select the book icon under the structure name to read information specific to that structure.

You are responsible for the identification of **all bolded terms**.

A. Go to Module 49.2 Pelvic Ligaments.

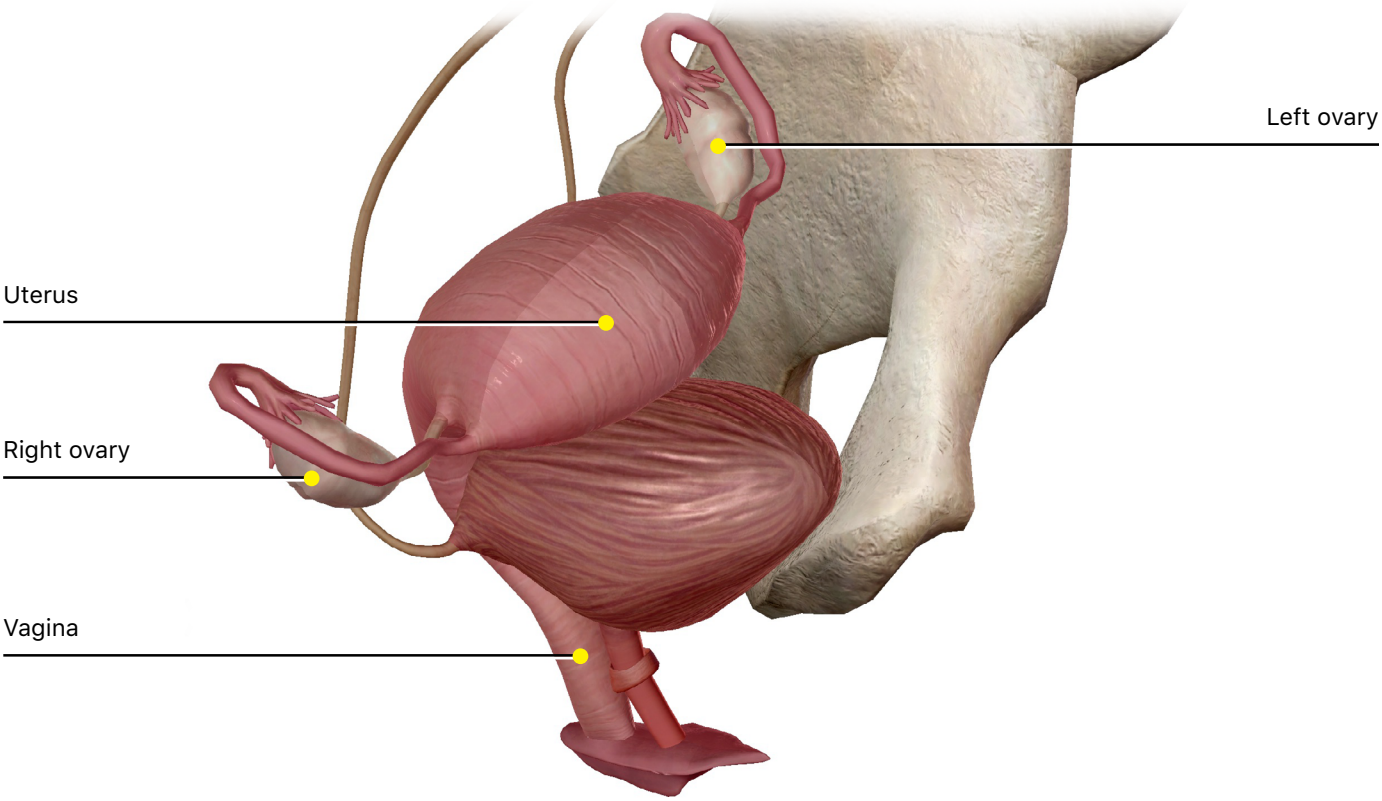


1. Select the term Pelvic ligaments at the top of the left-side menu. The **reproductive organs** and the developing fetus are supported by ligaments in the pelvis. Locate the following ligaments:

- **Anterior sacroiliac ligaments**
- **Posterior sacroiliac ligaments**
- **Sacrotuberous ligaments**
- **Sacrospinous ligaments**
- **Iliolumbar ligaments**
- **Endopelvic fascia**
- **Cardinal ligaments**
- **Pubocervical fascia**
- **Uterosacral ligaments**
- **Obturator membranes**
- **Inguinal ligaments**
- **Perineal membrane**

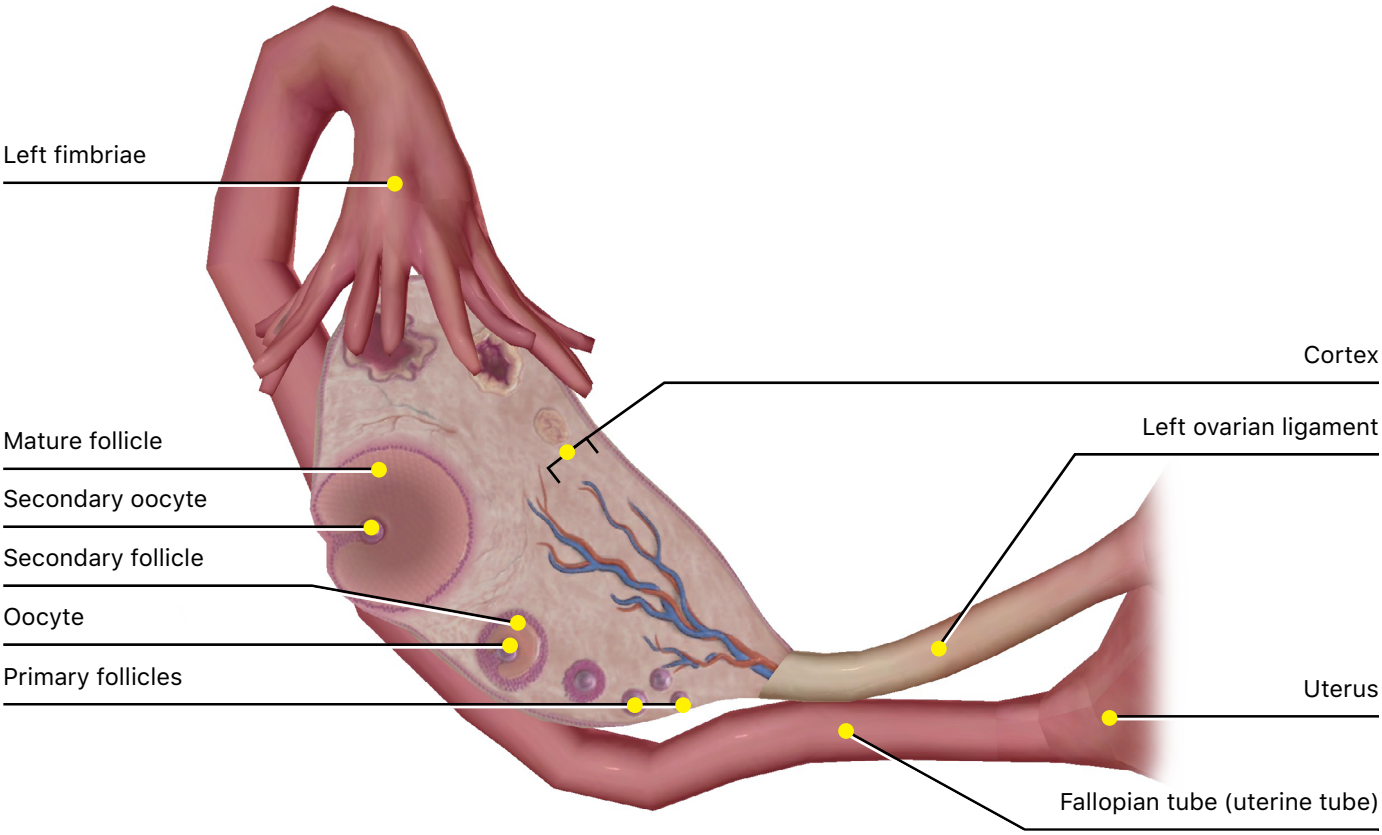
Which of these is the only one that is not paired?

B. Go to Module 49.3 Ovaries. Explore the model and read the definitions.



1. Review the term for **ovaries**. The ovaries are the female primary **sex organs** or _____.

2. Look at the way the ovaries are connected to the **uterus**. The ovaries are connected to the uterus by the _____ ligament.



C. Navigate forward with the Next arrow (the forward arrow on the bottom left) to advance to Module 49.4 Ovary Internal Anatomy.

Select Ovary interior. You can select the model to see the detail. Watch the video in module 49.6 and answer the following:

1. The cortex of the embryonic ovary contains numerous stem cells called _____.

2. These cells divide by mitosis while the female is a fetus and some of the daughter cells mature to become _____.

3. These primary oocytes begin meiosis I but then pause before birth. They are enclosed in small spherical structures called _____.

   a. After puberty, the follicles housing primary oocytes grow and become _____.

   b. Many of the primary oocytes complete meiosis I to become _____, each containing _____ chromosomes.

c. Some of these secondary oocytes begin meiosis II but they pause before this second meiotic division is completed. They are now called _____.

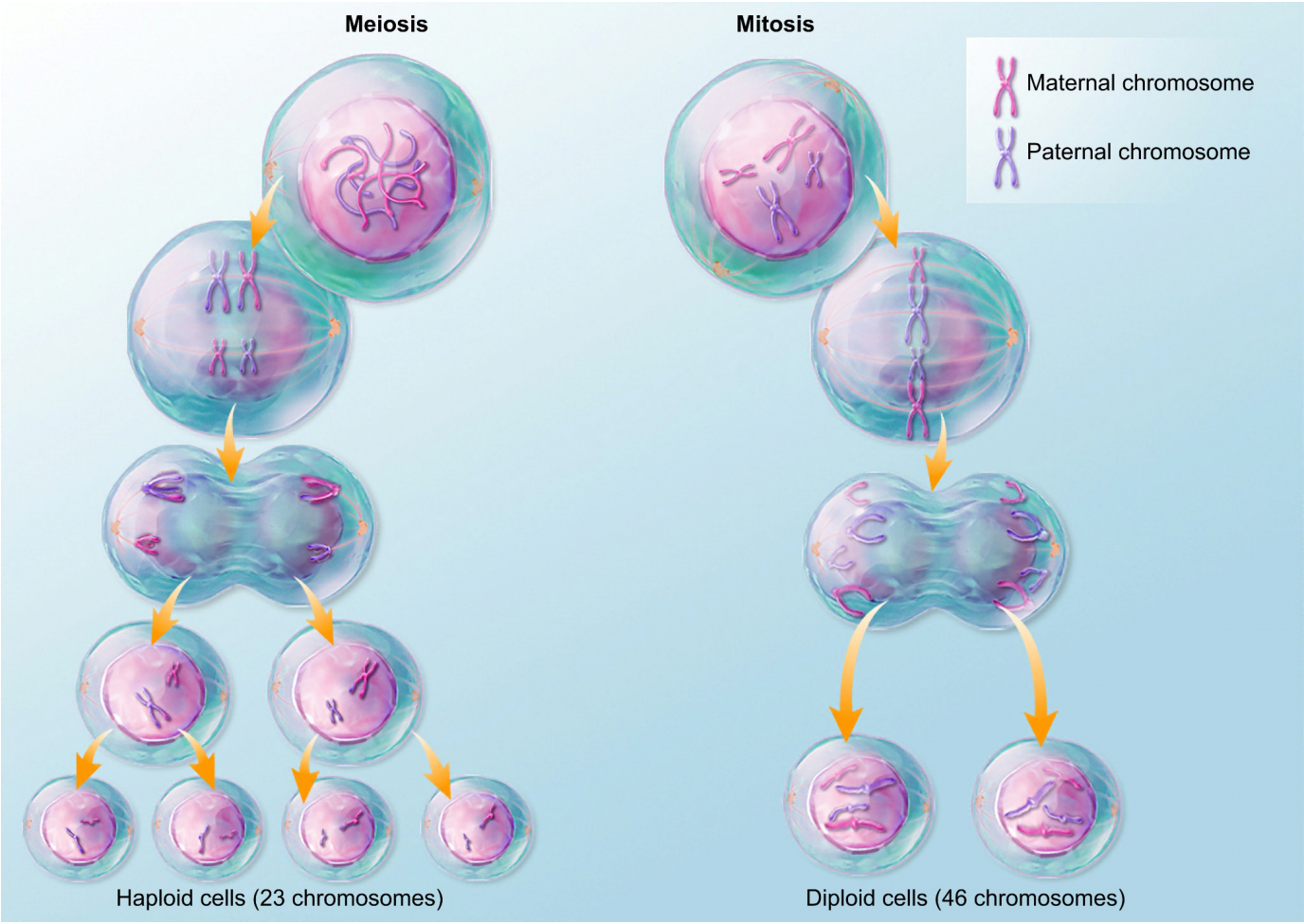
d. Their follicles grow larger and begin to fill with fluid until they become _____.

e. Each month until _____ one of these follicles housing an active secondary oocyte will grow very large, approach the surface of the ovary, and _____.

f. Look at the **follicle** on the left in this diagram. It is about to burst and this **secondary oocyte** will be released into the **uterine tubes**. This process is called _____.

g. The secondary oocyte pauses meiosis II and is carried into the uterus by muscular contractions of the _____. If it is fertilized it will complete meiosis II.

Note *that the terminology of human female gametes is difficult because they never truly become ova—they are fertilized before meiosis is complete. We will use the general term "***egg***" for all stages of female gamete development, and the specific term "***oocyte***" to refer to a female gamete that has begun meiosis. Once the secondary oocyte has been fertilized it becomes a* **zygote**.



D. Go back to the unit menu and select Cells and Tissue. Scroll down to 3. Cell Life Cycle and select 3.5 Meiosis.

1. **Meiosis**, depicted on the left, happens only during the formation of eggs or sperm and takes two rounds of **cell division** to complete. Note that after the first division there is only one copy of each **chromosome**.

2. Originally there were two long ones and two short ones, but after the first division there is only one long one and one short one. This is how the genetic information from the parents is split in half so that the fertilized egg gets half its **genetic information** from the father and half from the mother.

3. The second division splits these single chromosomes in half but the number of chromosomes doesn't change. After the second division there is still one of each of the two kinds of chromosomes in this diagram.

a. After the first meiotic division sex cells are said to be _____.

***Note**: In human females only one of the four unique cells formed at the end of meiosis will become an oocyte, and it will get most of the cytoplasm. The other three will disintegrate.*

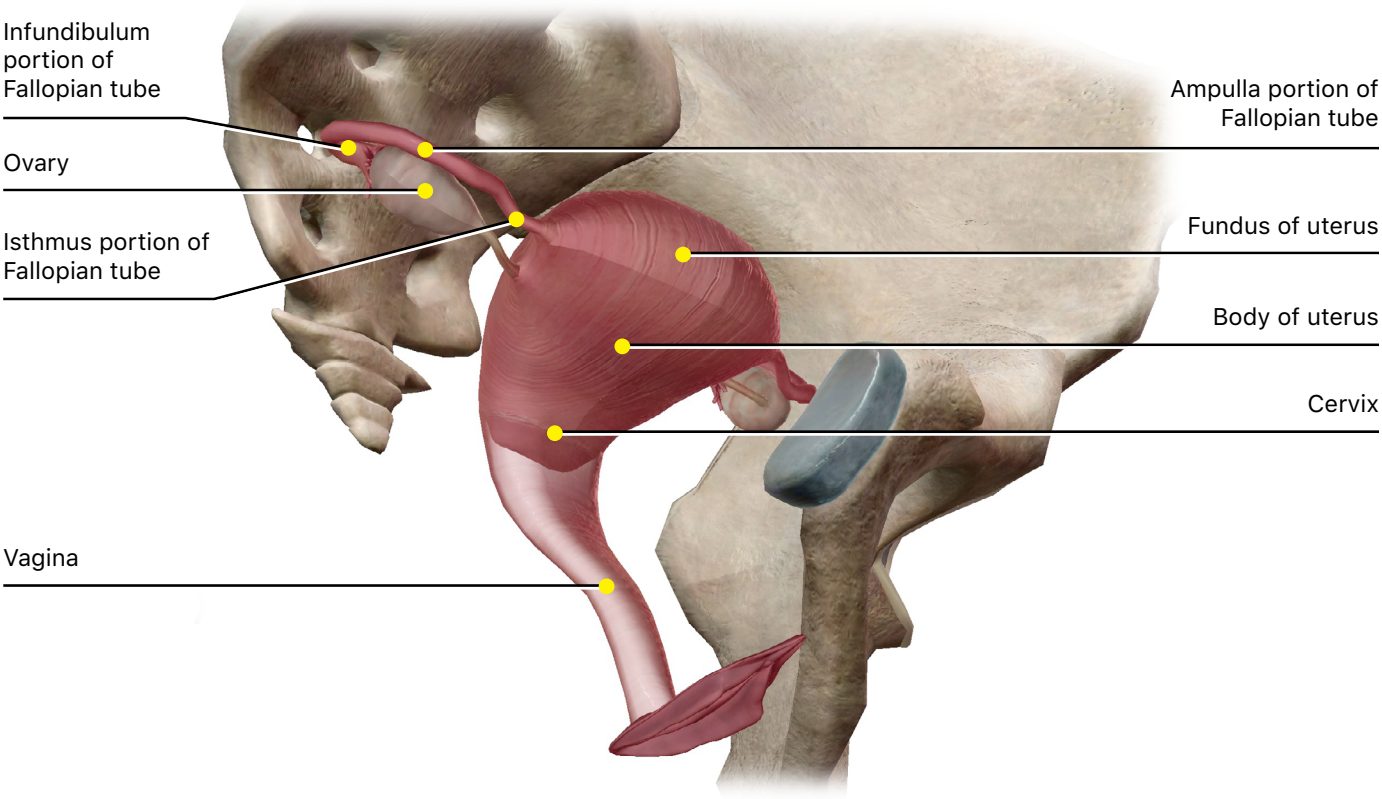
b. How many chromosomes are in a full set of adult cells?

c. How many are present in oocytes after the first meiotic division?

d. How many are present after the second meiotic division?

4. Review the animation 49.6 Female Sex Cells at this time if you need to.

E. Select Module 49.13 Ovulation



1. Select Uterine tube and read the definition.

   a. The **uterine tubes** are also called the _____ or _____.

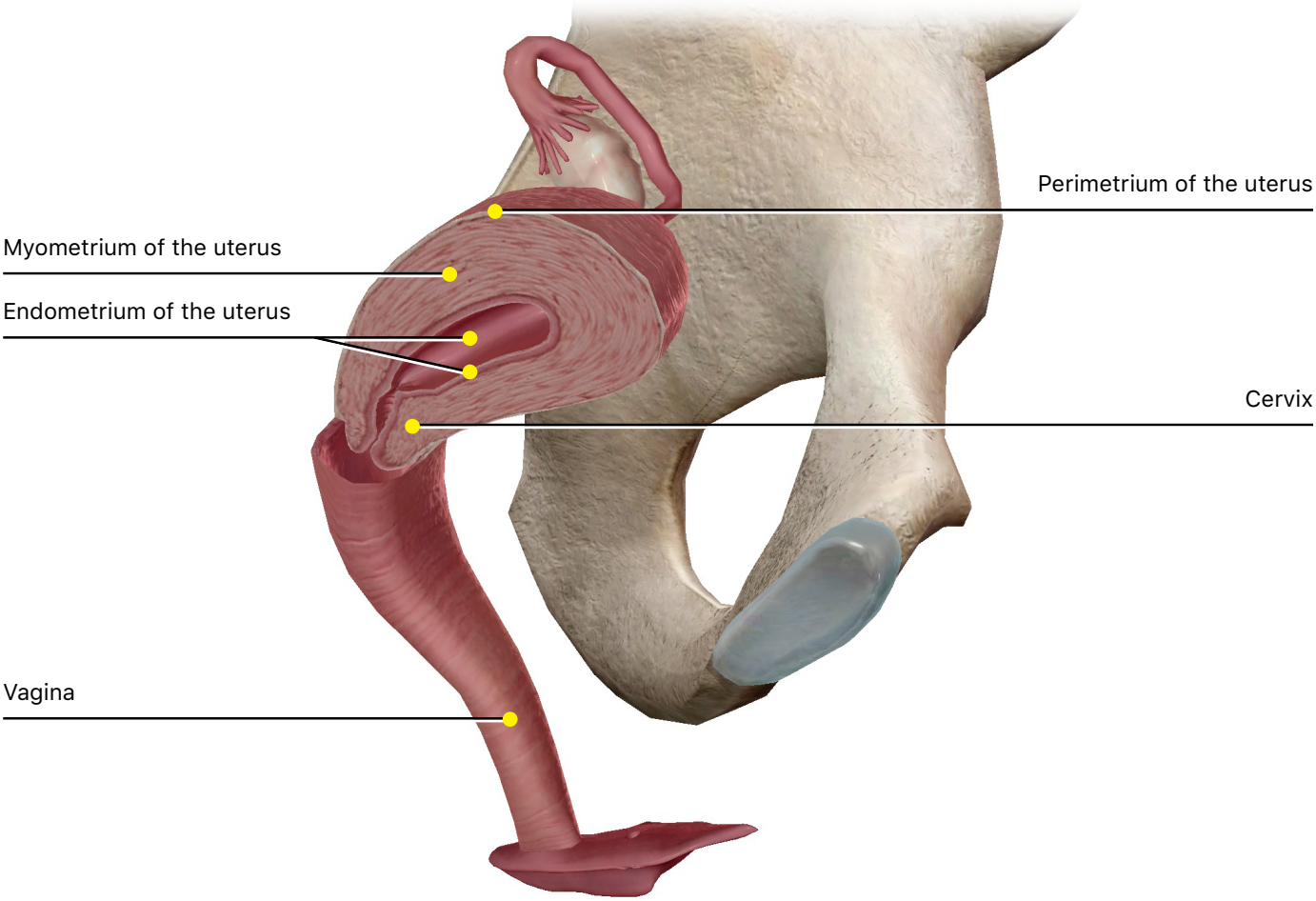
   b. The uterine tubes are supported by part of the broad ligament called the _____.

   c. Beginning with the end closest to the ovary, find the three divisions of the uterine tube. They are the _____, which is surrounded by _____, the _____, and the _____.

   Note: *Oocytes that are* ***ovulated*** *must move into the infundibulum. Occasionally, since this end of the uterine tube is open to the abdominal cavity, fertilized eggs move into the abdominal cavity and implant there by mistake. This is called an ectopic (in the wrong place) pregnancy.*

   d. Fertilization takes place in the _____ of the uterine tube.

   e. The uterine tubes are capable of muscular contractions that propel an oocyte down its length to the uterus. This is accomplished by layers of _____ in the wall of the organ.



2. Select Uterus and read the definition and find all of the structures listed below.

a. Oocytes travel through the _____ and enter the upper part of the uterus.

b. The lower part of the uterus is continuous with the _____.

c. The _____ is the upper part of the uterus, above the uterine tubes.

d. The lower, larger part is the _____ of the uterus.

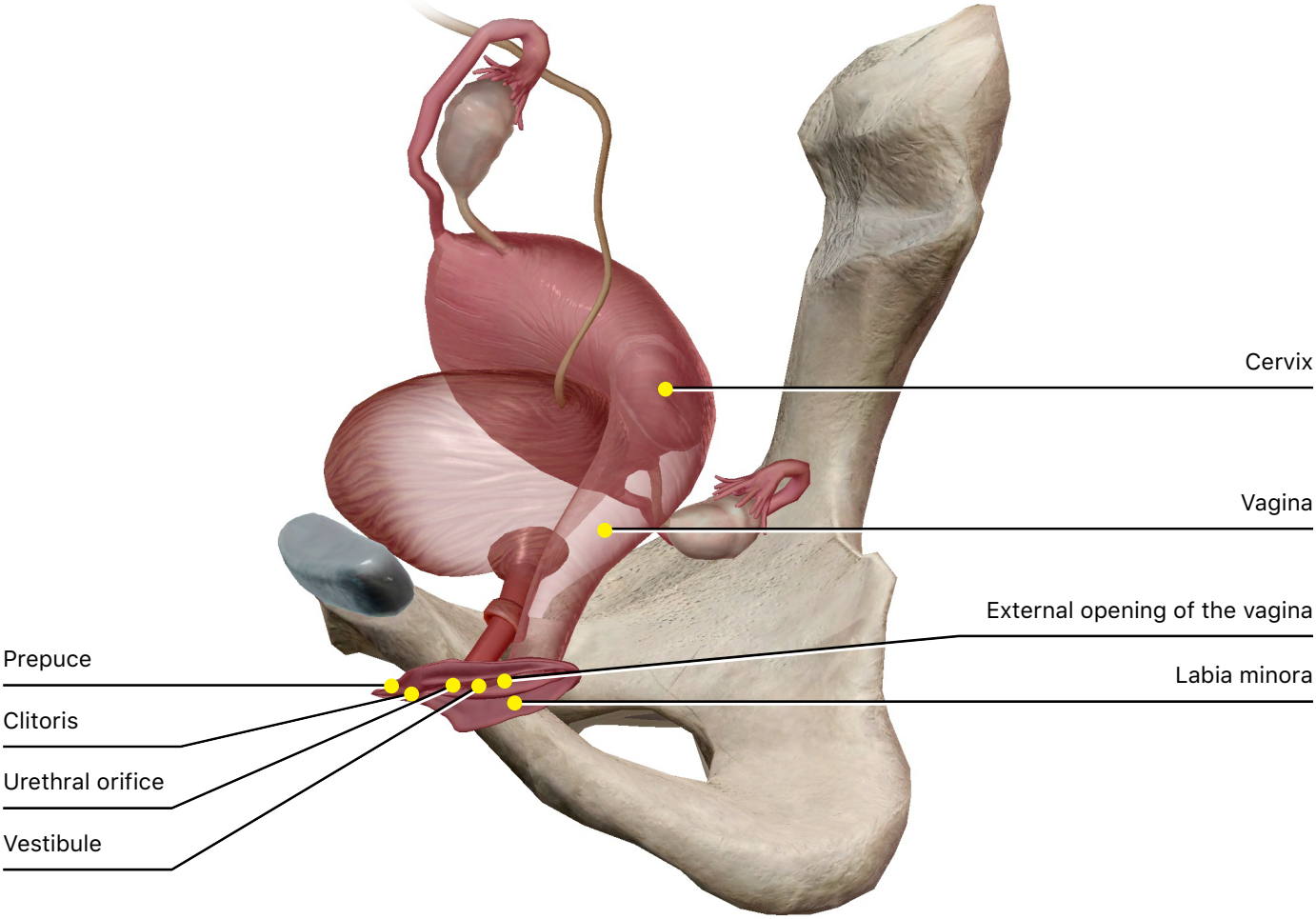
e. If you have rotated the model, refresh the view to center the uterus. If the pubis is visible, select it and hide it. Then select the right fundus of the uterus and hide it. You should now see a section showing the layers of the uterus. During pregnancy the uterus expands greatly, mainly due to its middle layer of _____.

f. Find the fundus and the body of the uterus in this sectional view.

g. A narrow constriction called the _____ leads to the _____ which in turn leads to the vagina.

h. A fertilized egg can embed in the uterus and develop into an _____ then a _____ during the process called pregnancy.

F. Select Module 49.10 Vagina



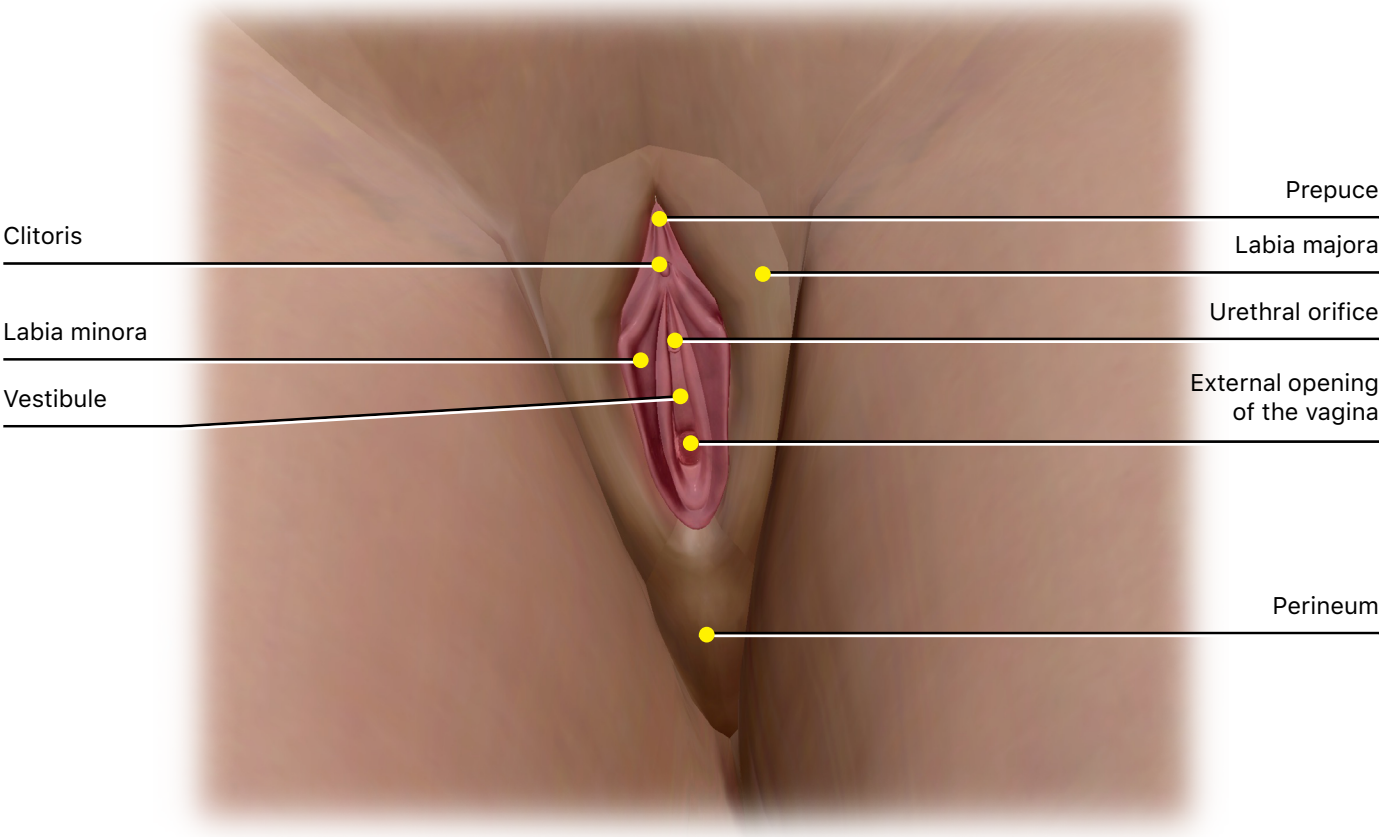
1. Select Vagina and read the definition.

    a. The **vagina** extends from the cervix of the uterus to the _____.

2. Select Cervix, which will fade the vagina, in order to view this structure that connects the uterus to the vagina. The **cervix** secretes a clear, viscous _____ that changes at different times during the menstrual cycle.

3. Select Vestibule and locate the external opening of the vagina. Rotate the model so that you can find the opening of the vagina and the external opening of the urethra, the **urethra orifice**.

4. Find the **labia minora**, the folds of skin surrounding the **vestibule** and the **clitoris**. The **prepuce** covers the clitoris. The female prepuce is homologous with the male _____.



5. Navigate forward with the Next arrow to go to **Module 49.11 External Genitalia**. Locate the vulva and list all the structures that are included in the vulva.

6. Select **Labia majora** to locate these outer layers of skin that surround the labia minora.

7. Finally, locate the **perineum**, which corresponds to the pelvic outlet.

G. Select Module 49.14 Female Sex Hormones.

1. Select Anterior pituitary (adenohypophysis) and read the definition. Observe that the anterior pituitary makes up half of the **pituitary gland**.

2. Zoom in and look more closely at the anterior pituitary. Locate the three parts of the anterior pituitary: the pars _____, the pars _____, and the pars _____.

3. The anterior pituitary produces many hormones important for sexual reproduction. Go to the Endocrine unit and explore modules 25.13, 25.14, and 25.15.

a. Luteinizing hormone (LH) targets the ovaries, triggering ovulation. It also sustains the follicle that remains after ovulation for a short time.

b. Follicle stimulation hormone (FSH) stimulates the growth of follicles each month in women between puberty and menopause. It also participates in the development and maturation of the reproductive system.

c. Prolactin stimulates the mammary glands (breasts) to enlarge during pregnancy and to produce milk. It also plays many other roles in growth and development.

4. Return to **49.14 Female Sex Hormones** and select Ovaries. As ovaries develop in a female fetus they produce the female sex hormones _____ and _____. These hormones control the development of the female reproductive system and participate in the regulation of the _____ cycle.

5. Navigate forward with the Next arrow to view **49.15 Mammary Glands.** Click on the following structures and read the definitions.

a. Select Mammary glands to see the location of these paired accessory glands of the female reproductive system. Mammary glands (**breasts**) are actually modified _____ glands and contain a large amount of adipose tissue.

b. Each breast contains many **lobules** that secrete **milk** into ducts. These ducts terminate at the _____, which is surrounded by a pigmented circle of skin called the _____. Select either mammary gland, then deselect it. Observe the fatty connective tissue and the location of the nipples. Select any part of the torso or breast and select Show, then select any other part of the model to deselect the skin. You should now be able to see the skin and the appearance of the areola.

c. Select Lobules and zoom in to view the many lobules in each breast. These lobules contain **alveoli** that produce _____ when a woman is lactating.

d. Select **Lactiferous ducts**. Observe how the ducts converge on_____ in the areola that serve as reservoirs for milk.

6. Males also have mammary glands and nipples, but there is little fat in the glands and the ducts are rudimentary. They do not produce milk.

7. Navigate forward with the Next arrow to view **49.17 Lactation**. Watch the animation. Then go to the Endocrine unit and explore **Module 25.19 Oxytocin (OXT)**. Then answer the following question:

a. **Lactation**, the secretion of milk by the mammary glands, is controlled by which hormones?

H. Select the Module 49.12 Female Reproductive Cycle.

The tissue in the top half of the image shows follicles containing eggs as they develop in the ovary during a cycle. The bottom image shows the development of the lining of the uterus during the same **cycle**.

1. How long is the average cycle in women of child-bearing age?

2. The beginning of each cycle is marked by the beginning of **menstruation**, which is the shedding of the uterine lining via the vagina. Also at this time several new follicles will begin to develop in the ovaries. One follicle will become dominant and will be the only one to ovulate. What day of the cycle does **ovulation** normally happen?

3. Describe the two main **ovarian phases** and state when they occur in the cycle. Include the roles of hormones.

4. Describe the three **uterine phases** that occur in the first 2 weeks of the cycle. Describe the levels of progesterone and estrogen during each phase.

Note the yellow-colored empty follicle that remains in the ovary after ovulation. We shall see in the unit on Development that this follicle plays an important role during the early stages of pregnancy.

PUTTING IT ALL TOGETHER

1. Describe the process of oogenesis.

2. Trace the path of oocytes from the time they are ovulated until they embed in the uterus.

3. Which structures of the female reproductive system does a baby pass through during birth?

4. Which are the accessory glands of the female reproductive system?

5. Trace the path of a mature oocyte from ovulation to implantation.

6. Explain how the uterine lining and the mammary glands support the developing baby.

7. List the hormones that maintain and control the organs and stages of female reproduction. State where they are produced and what they do.

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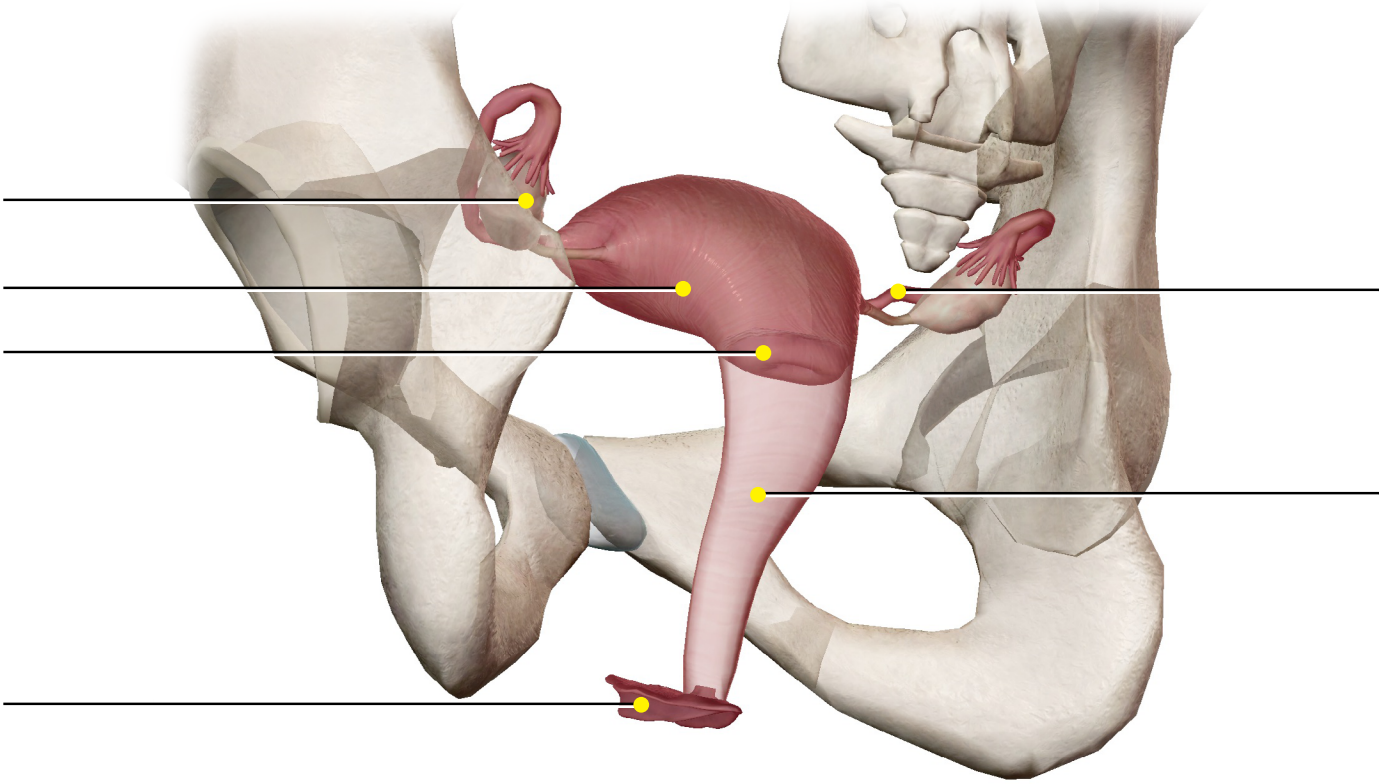
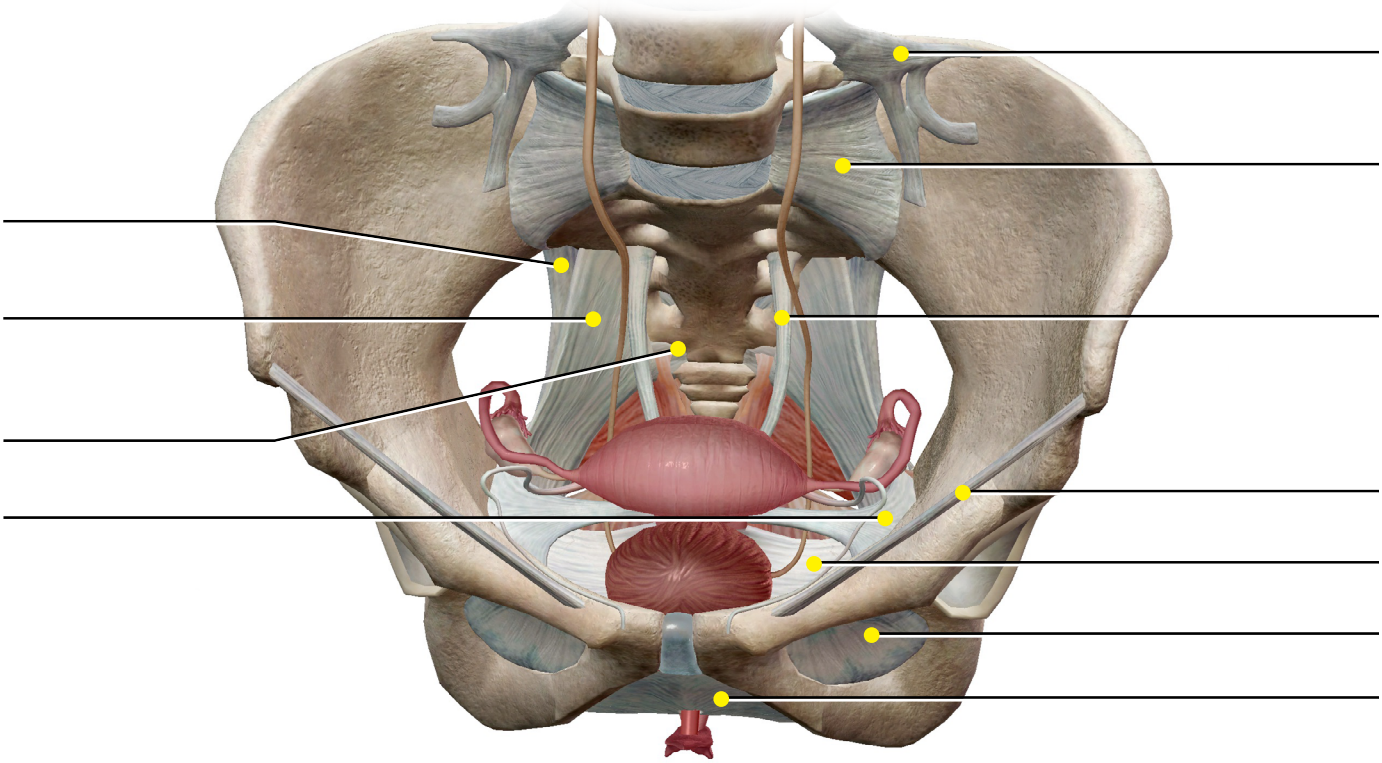
Student Practice

Label the structures in the following figures.

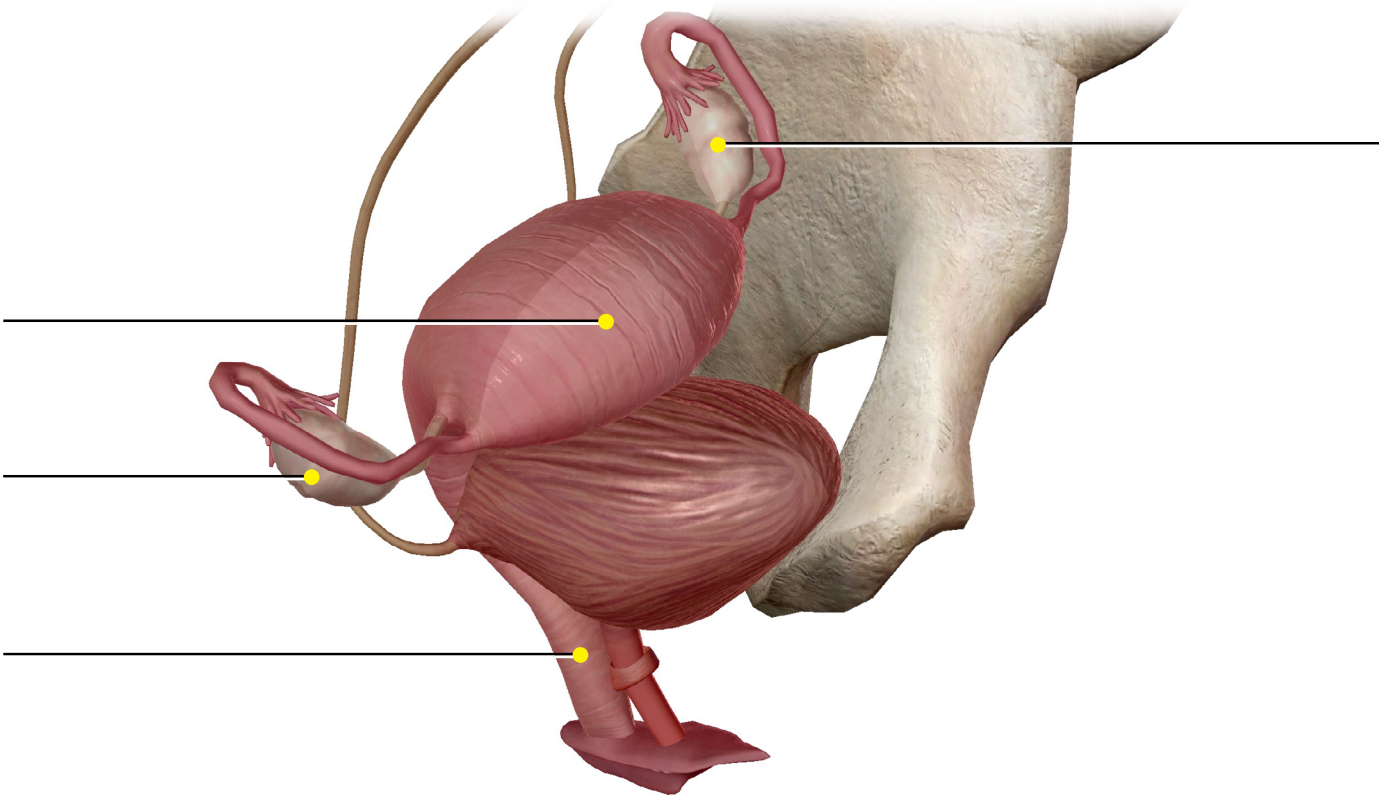
Module 47.3 Female Reproductive Anatomy



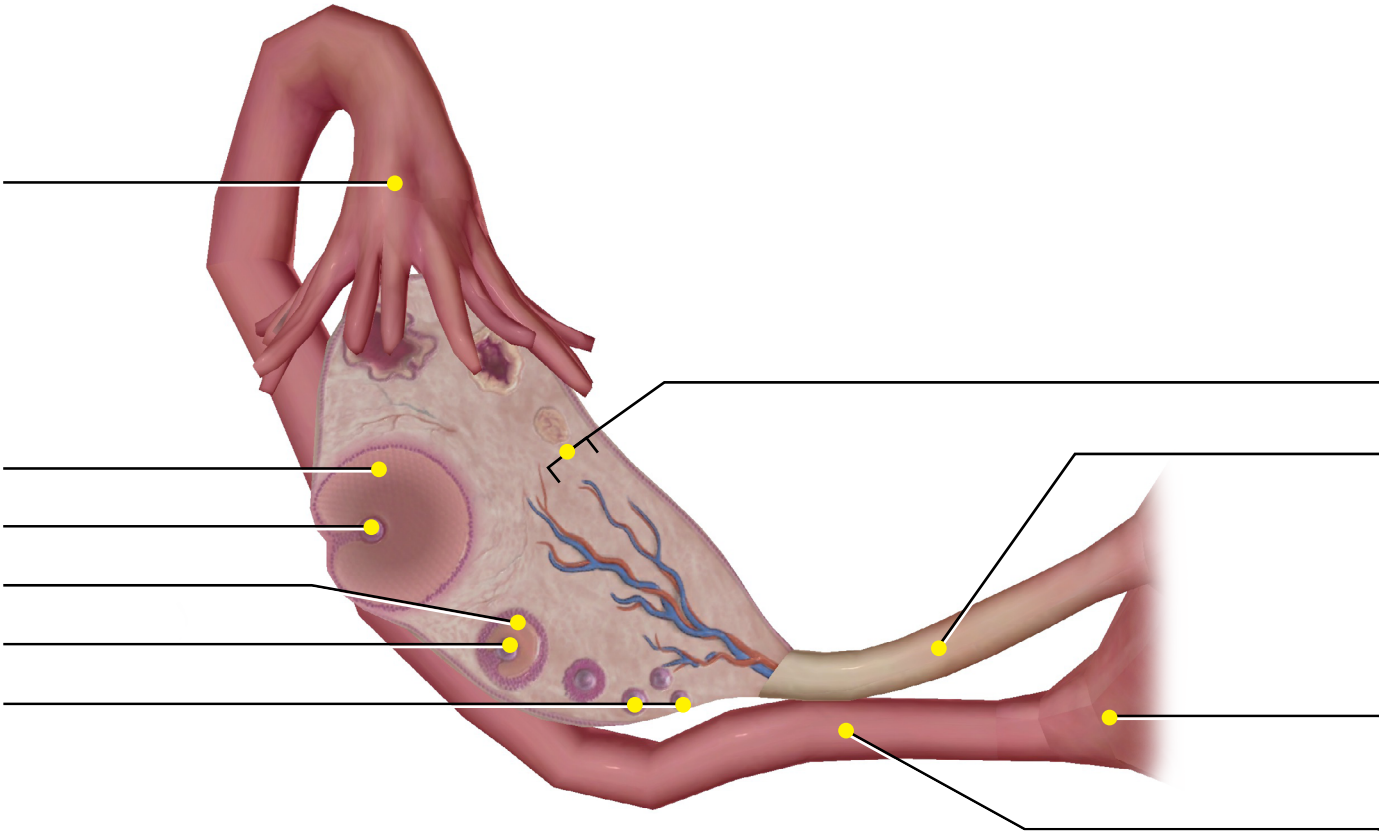
Module 49.2 Pelvic Ligaments



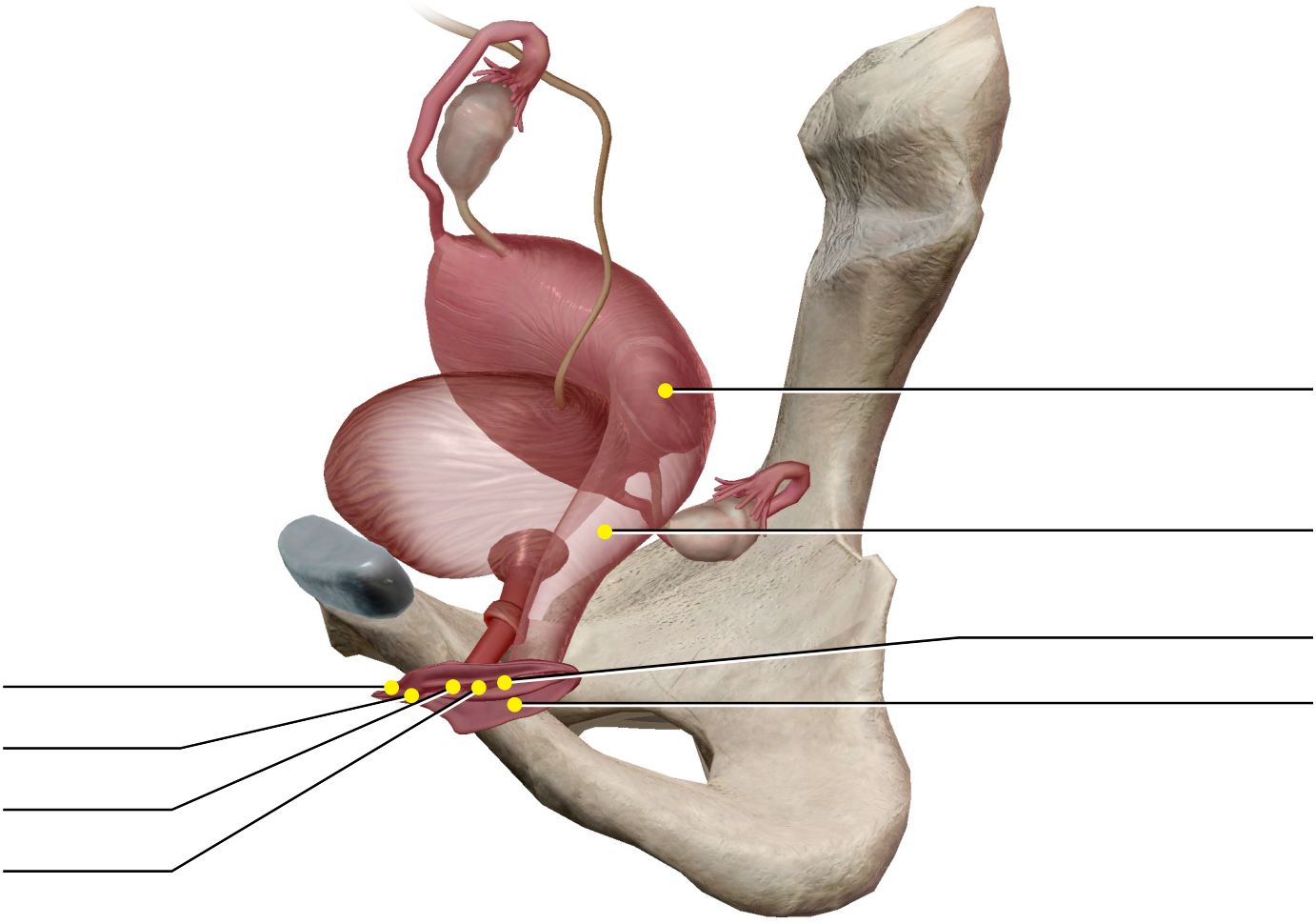
Module 49.3 Ovaries



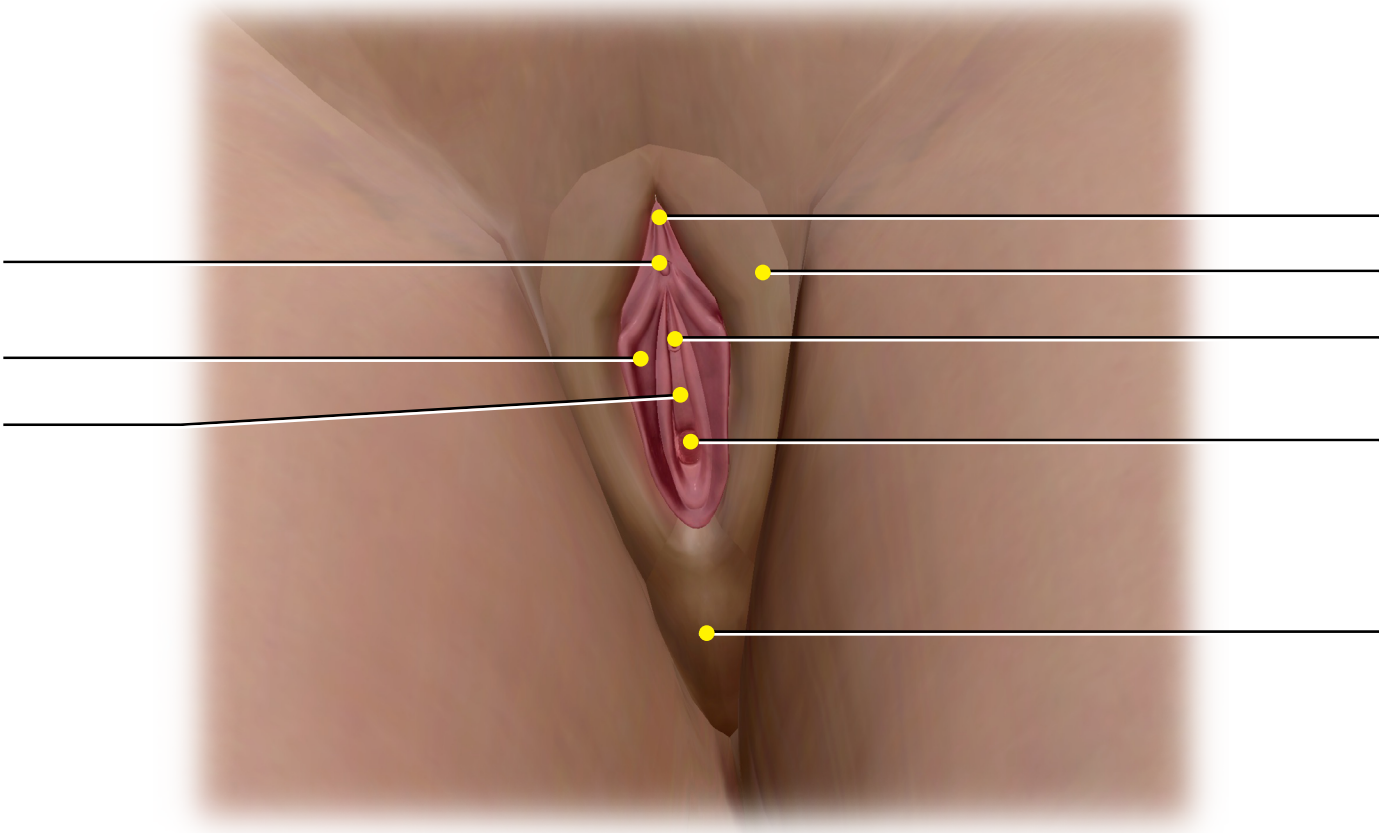
Module 49.4 Ovary Internal Anatomy



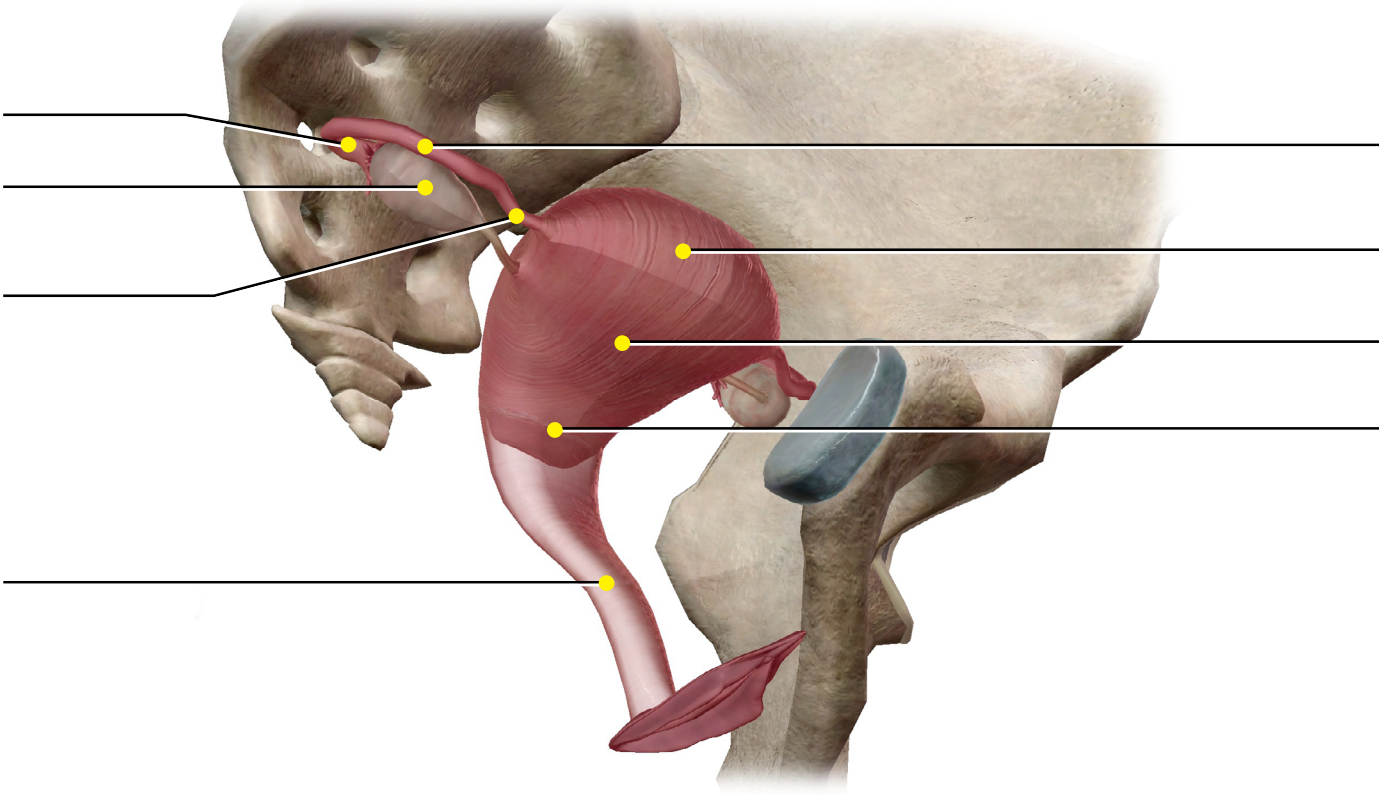
Module 49.10 Vagina



Module 49.11 External Genitalia



Module 49.13 Ovulation



Module 49.13 Ovulation