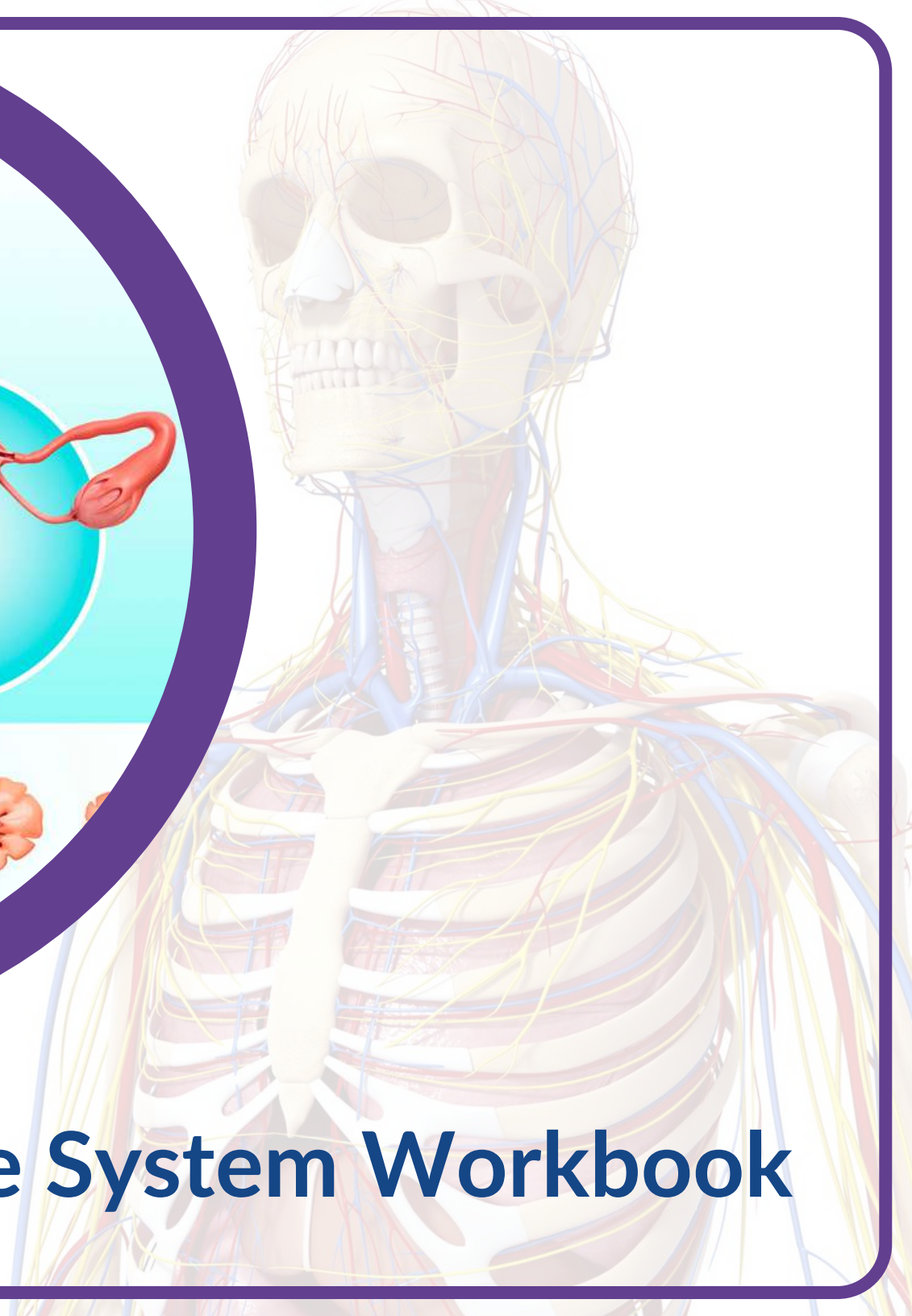


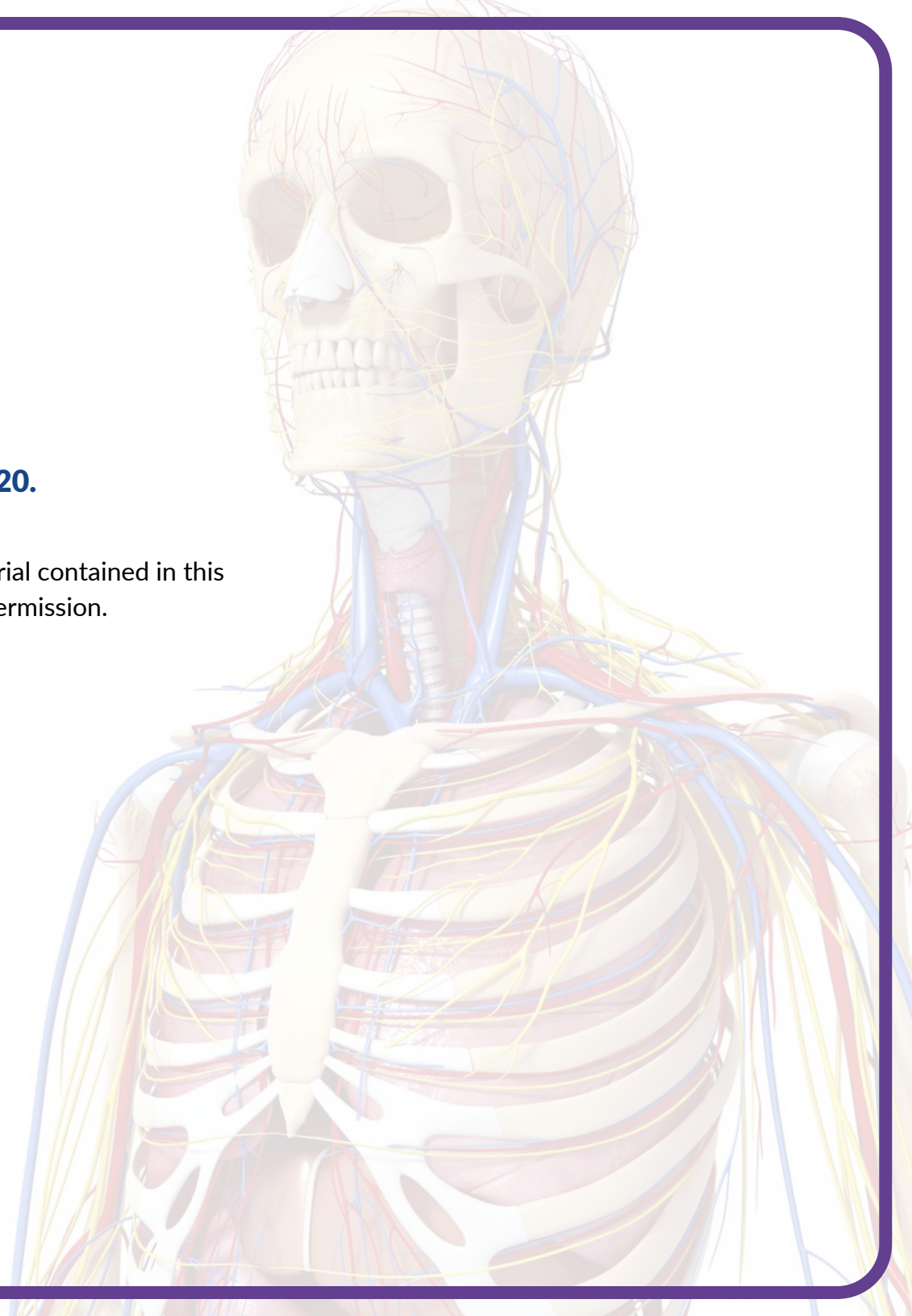


Reproductive System Workbook



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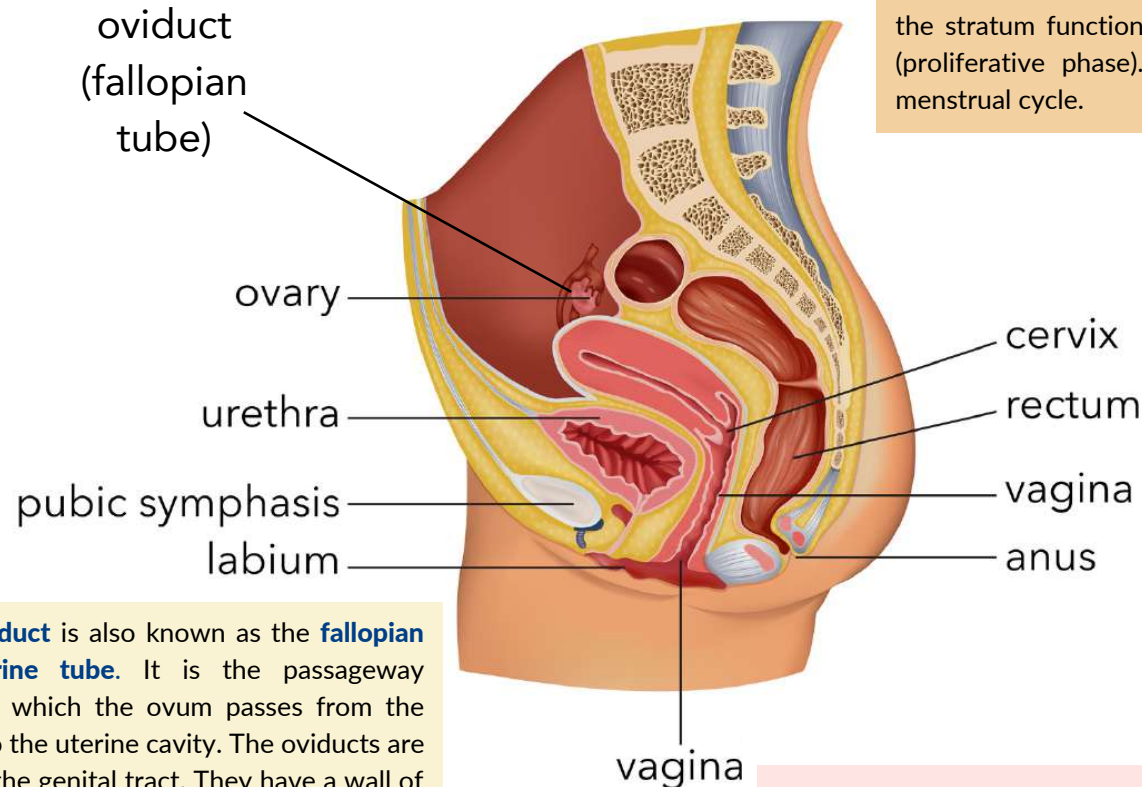
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Learning Objectives

- Describe the function of the reproductive system and its major components.
- Describe the relationships between the different components of the reproductive system.
- Explain how the reproductive system is interdependent with other organ systems.
- Explain how the reproductive system maintains homeostasis in the body

Reproductive System Overview: Female

The **uterus** is made up of an external layer of smooth muscle called the **myometrium**, and an internal layer called the **endometrium**. The endometrium has three layers: **stratum compactum**, **stratum spongiosum** (which make up the stratum functionalis) and **stratum basalis**. The stratum compactum and stratum spongialis develop into the stratum functionalis during the first half of the menstrual cycle (proliferative phase). The wall of the uterus changes during the menstrual cycle.



The reproductive system functions to **produce egg and sperm cells**, to **transport and sustain** these cells, and to **nurture** the developing offspring.

COMPONENTS

Ovaries

Fallopian tubes

Uterus

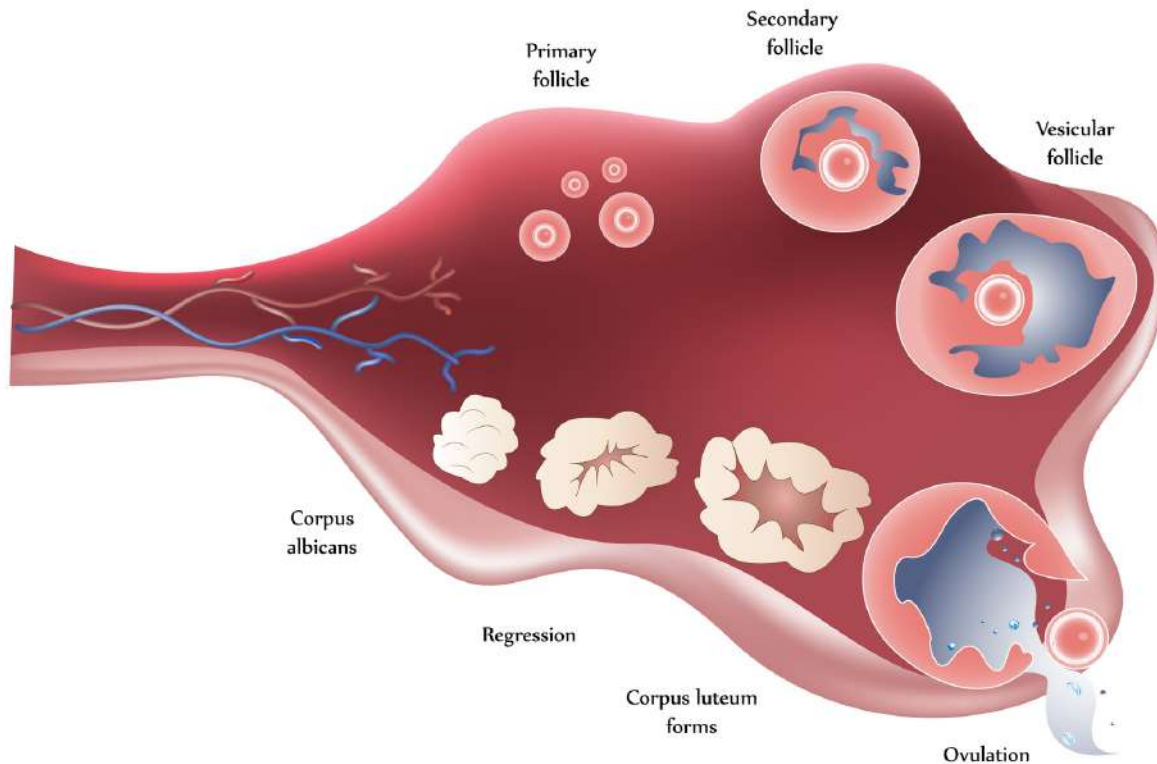
Cervix

Vagina

The **oviduct** is also known as the **fallopian** or **uterine tube**. It is the passageway through which the ovum passes from the ovary to the uterine cavity. The oviducts are part of the genital tract. They have a wall of smooth muscle, an inner mucosal lining and an outer layer of loose supporting tissue (**serosa**). The proximal part is called the **infundibulum**, which is flared and 'fringed' (**fimbriated**). This leads into a longer, thin walled **ampulla**, which has primary, secondary and tertiary longitudinal mucosal folds. This leads into a short thicker-walled **isthmus**, which has fewer longitudinal mucosal folds. This leads into an intramural portion, that extends through the uterine wall, and opens into the uterine cavity.

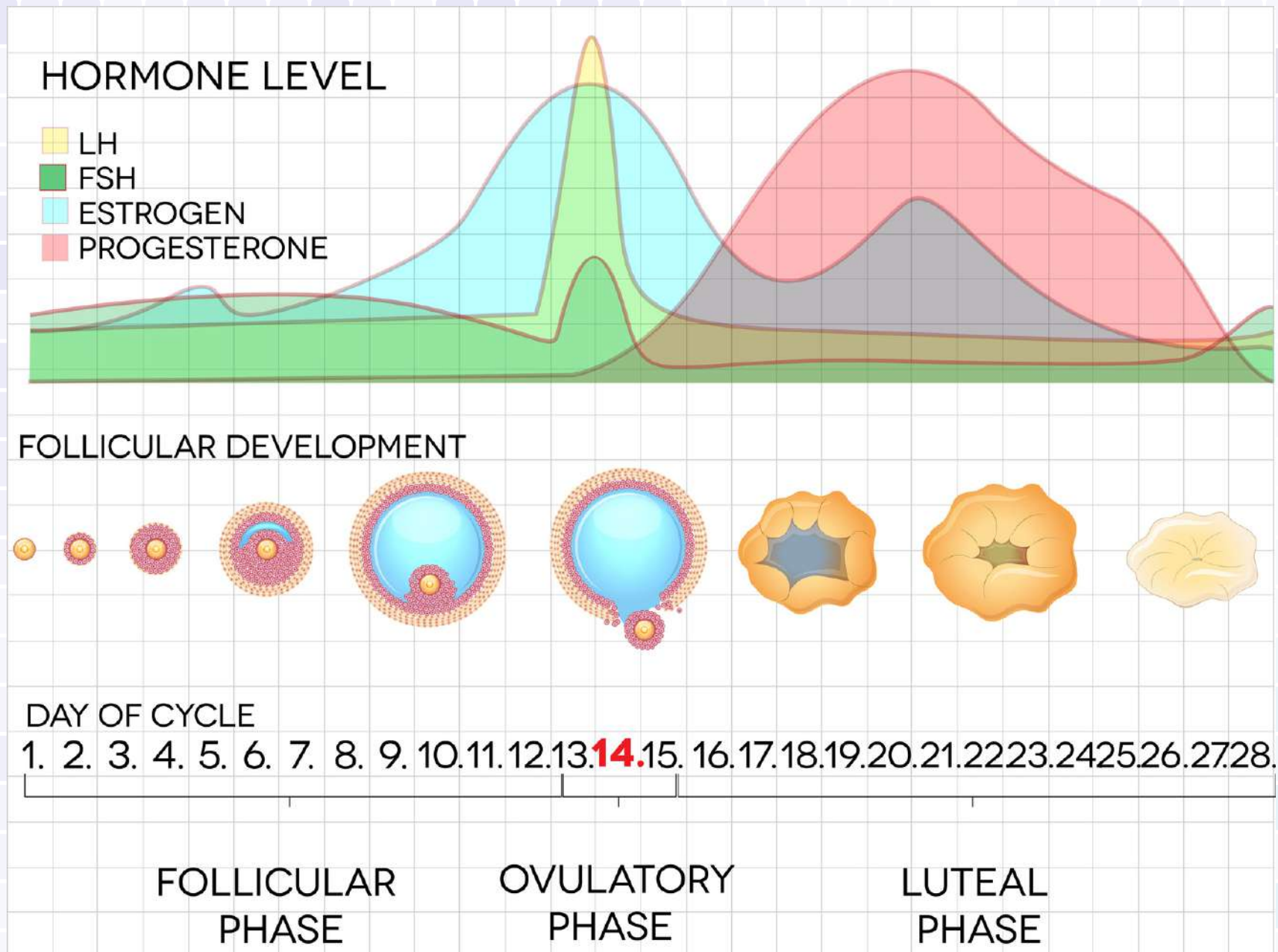
The vagina is a muscular tube. The lining **epithelium** is stratified squamous. Underneath the epithelium is a layer of **lamina propria**, which is rich in elastic fibres, and does not have any glands. Under the lamina propria layer is a layer of **smooth muscle**, which has an inner circular and outer longitudinal layer. Finally, there is an **adventitial layer**, which merges with that of the bladder (anteriorly) and rectum (posteriorly). The elastic LP and smooth muscle enable the vagina to distend, particularly during birth.

Ovary



The ovary is where **oogenesis** occurs. Ovaries are stimulated by **gonadotrophin** from the **anterior pituitary**. Ovaries also have an endocrine function - they release **estrogen and progesterone**. The genital tract makes up the rest of the female reproductive system: **fallopian tubes** take the ova to the **uterus**. The uterus is a muscular organ, and its mucosal lining undergoes hormone dependent changes. The vagina is a muscular tube that leads to the outside. The ovaries are small almond shaped structures, covered by a thick connective tissue capsule - the **tunica albuginea**. This is covered by a simple squamous mesothelium called the **germinal epithelium**. The ovary has a cortex, which is where the **ovarian follicles** can be found, and a highly vascular **medulla**, with coiled arteries called **helicrine arteries**. The **oocytes (eggs)** are surrounded by epithelial cells and form follicles. The ovary contains many primordial follicles, which are mostly found around the edges of the cortex. There are fewer follicles in different stages of development.

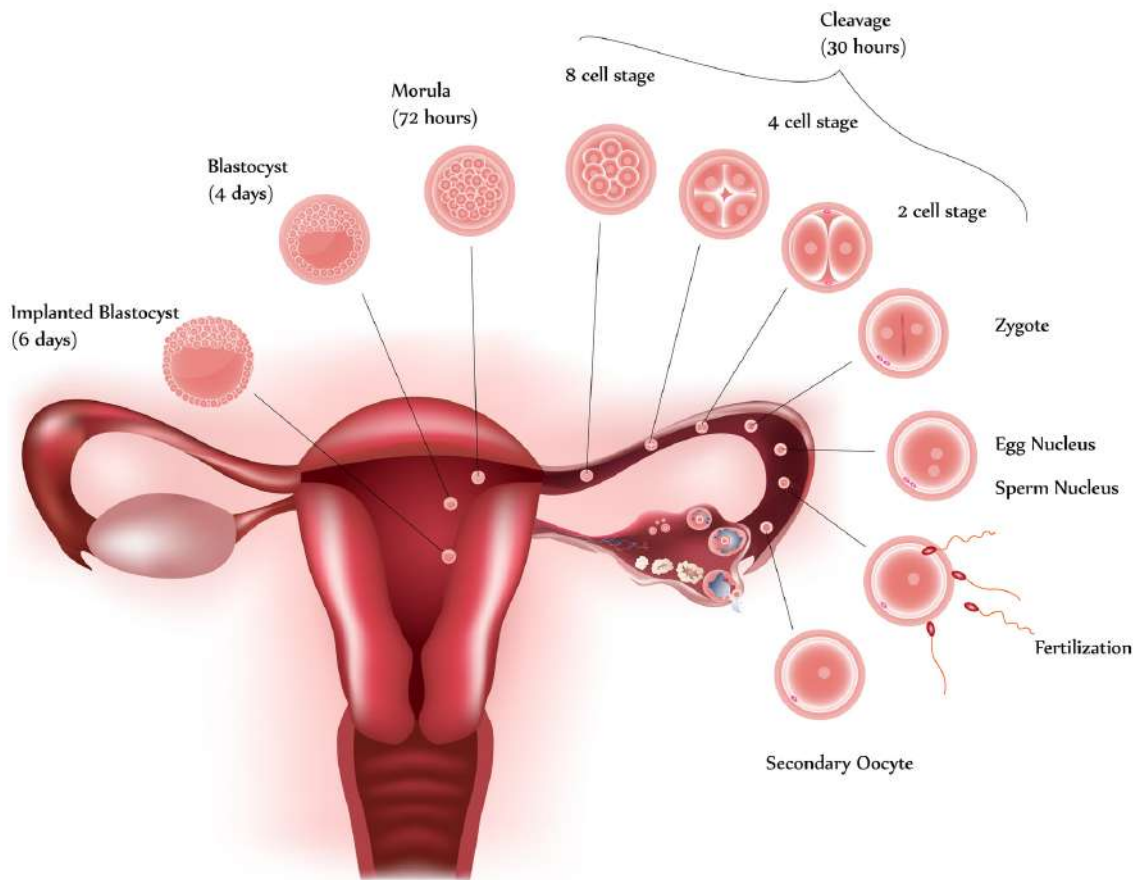
Menstrual Cycle



Menstrual Cycle

Development of the follicles is stimulated by production of **follicle stimulating hormone (FSH)** by the **pituitary gland**. Ripening of the follicles then results in an **increase in estrogen levels**, as estrogen is secreted by **follicular cells**. This increase in oestrogen levels feeds back to the pituitary, and suppresses further release of FSH (**negative feedback**). The follicles also release a second hormone called **inhibin**, which also suppresses further production of FSH. As the oestrogen levels rise, this triggers a mid cycle surge in a second pituitary hormone called **Lutenising hormone (LH)**, which causes the follicle to rupture (**ovulation**). LH also causes ruptured follicles to lutenise, forming a transitory endocrine organ called the **corpus luteum**. This looks yellow, due to its pigmented lutein cells (luteus is latin for yellow). The corpus luteum secretes **progesterone and estrogen**. The progesterone levels feed back to the pituitary and suppress further release of LH. If fertilisation does not occur, the corpus luteum degenerates into a small white fibrous scar called the **corpus albicans**. The resulting decline in progesterone (and to some extent oestrogen) levels precipitate **menstruation**. The decline in oestrogen levels, feeds back to the pituitary and there is a corresponding increase in FSH to begin the cycle all over again.

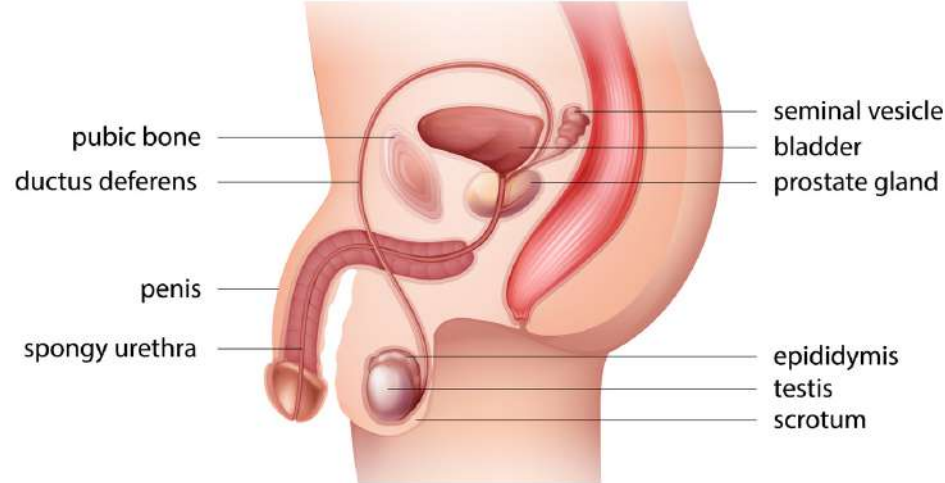
Ovulation, fertilization, implantation



The development of multi-cellular organisms begins from a **single-celled zygote**, which undergoes rapid cell division to form the **blastula**. The rapid, multiple rounds of cell division are termed **cleavage**. After the cleavage has produced over 100 cells, the embryo is called a **blastula**. The blastula is usually a spherical layer of cells (the blastoderm) surrounding a fluid-filled or yolk-filled cavity (the blastocoel). Mammals at this stage form a structure called the **blastocyst**, characterized by an inner cell mass that is distinct from the surrounding blastula. During cleavage, the cells divide without an increase in mass; that is, one large single-celled zygote divides into multiple smaller cells. Each cell within the blastula is called a **blastomere**.

In mammals, the blastula forms the blastocyst in the next stage of development. Here the cells in the blastula arrange themselves in two layers: the **inner cell mass**, and an outer layer called the **trophoblast**. The inner cell mass is also known as the **embryoblast** and this mass of cells will go on to form the **embryo**. At this stage of development, the inner cell mass consists of **embryonic stem cells** that will differentiate into the different cell types needed by the organism. The trophoblast will contribute to the **placenta** and nourish the embryo.

Reproductive System Overview: Male



COMPONENTS

Testes
Epididymis
Vas deferens
Seminal vesicles
Prostate gland
Penis

In the male reproductive system, the **scrotum** houses the **testicles** or testes (singular: testis), including providing passage for blood vessels, nerves, and muscles related to testicular function. The testes are a pair of male reproductive organs that produce **sperm** and some **reproductive hormones**. Each testis is approximately 2.5 by 3.8 cm (1.5 by 1 in) in size and divided into wedge-shaped lobules by connective tissue called septa. Coiled in each wedge are **seminiferous tubules** that produce sperm.

When the sperm have developed flagella and are nearly mature, they leave the testicles and enter the **epididymis**. This structure resembles a comma and lies along the top and posterior portion of the testes; it is the site of **sperm maturation**. The sperm leave the epididymis and enter the **vas deferens (or ductus deferens)**, which carries the sperm, behind the bladder, and forms the ejaculatory duct with the duct from the seminal vesicles.

The **penis** is an organ that drains urine from the renal bladder and functions as a copulatory organ during intercourse. The penis contains three tubes of erectile tissue running through the length of the organ. These consist of a pair of tubes on the dorsal side, called the **corpus cavernosum**, and a single tube of tissue on the ventral side, called the **corpus spongiosum**. This tissue will become engorged with blood, becoming erect and hard, in preparation for intercourse.

The walnut-shaped **prostate gland** surrounds the urethra, the connection to the urinary bladder. It has a series of short ducts that directly connect to the urethra. The gland is a mixture of smooth muscle and glandular tissue. The muscle provides much of the force needed for ejaculation to occur.

Reproductive System & Other Organ Systems



Respiratory System: The reproductive system requires oxygen in order to work properly, and the respiratory system provides the reproductive system with the oxygen it needs.



Digestive System: The digestive system works with the reproductive system by providing it with nutrients. The digestive system is the body system which breaks down food into small soluble nutrients which can be absorbed by the blood stream. The reproductive system needs energy and nutrients to perform its function and these are both provided by the digestive system.



Musculoskeletal System: The female reproductive system significantly strengthens the skeleton in women by stimulating acquisition of bone mass and biomechanical strength at puberty, but also presents significant challenges to the skeleton during pregnancy and lactation.



Endocrine system: Endocrine glands in the reproductive system produce sex hormones that are responsible for secondary sex characteristics in men and women. Sex hormones also contribute to the production of sex cells, or gametes. Female sex hormones regulate ovulation, the menstrual cycle, and pregnancy.

Reproductive System & Homeostasis

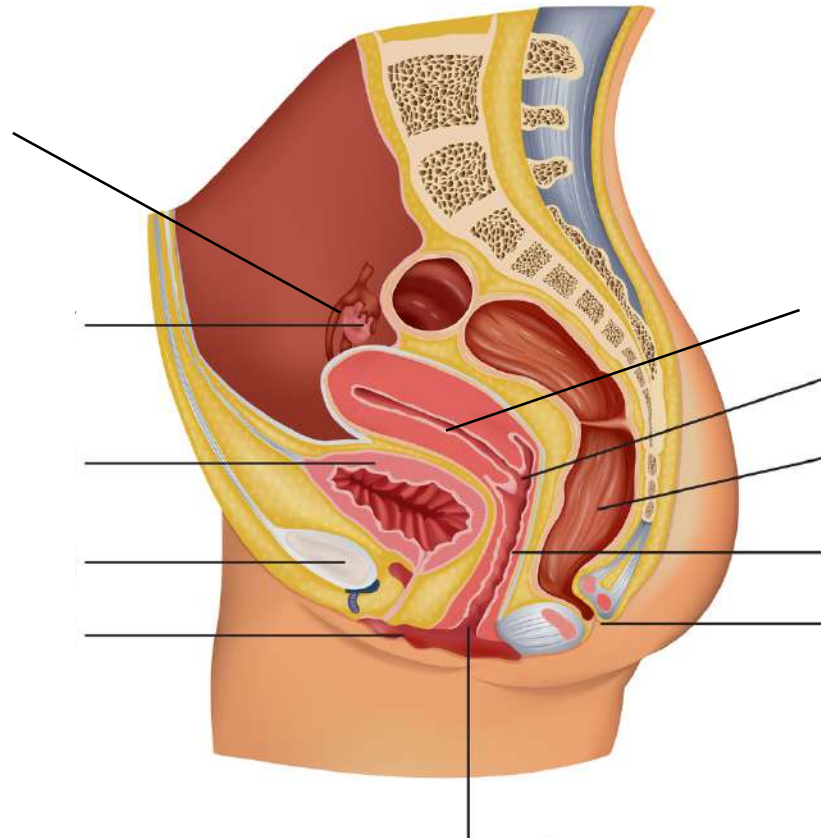
The reproductive system does little for the homeostasis of the organism itself. The reproductive system relates instead to the **maintenance of the species**. However, sex hormones do have an effect on other body systems, and an imbalance in sex hormones can lead to various disorders. For example, a woman whose ovaries are removed early in life is at higher risk of developing osteoporosis, a disorder in which bones are thin and break easily. The hormone **estrogen**, produced by the ovaries, is important for bone growth. Therefore, a woman who does not produce estrogen will have impaired bone development.

Review Break

- What is one way the reproductive system maintains homeostasis within the body?
- What is one way the reproductive system interacts with other body systems?
- What are the main components of both the male and female reproductive systems?

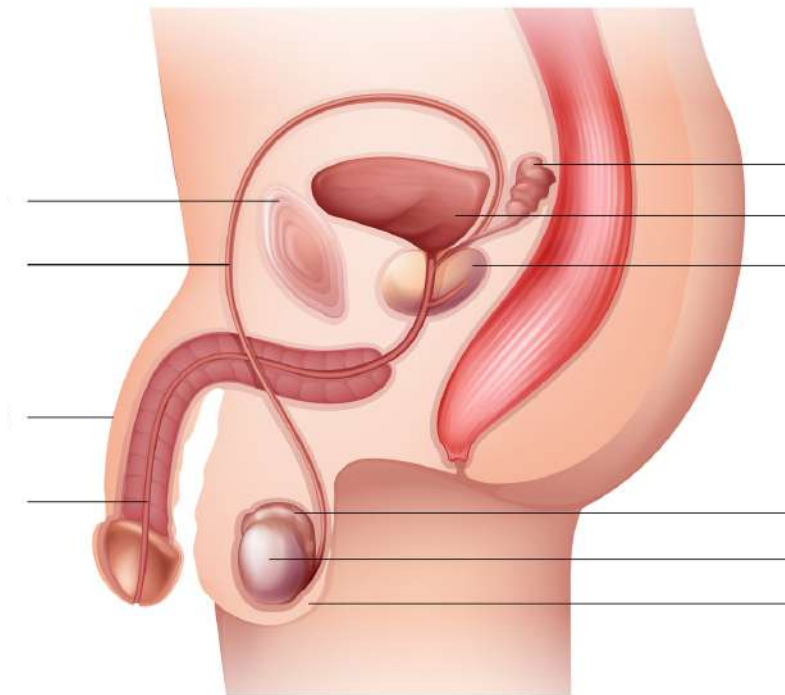
QUIZ!

Label the female reproductive system (without looking back through your workbook!).



QUIZ!

Label the male reproductive system (without looking back through your workbook!).



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