

# Unit 3

## REPRODUCTIVE SYSTEMS AND THE MENSTRUAL CYCLE

### Learning Objectives

By the end of this unit, the learner should be able to:

- ❖ Explain the importance of understanding the male and female reproductive systems
- ❖ Define the ovarian cycle, the menstrual (uterine) cycle and menstruation, the female reproductive cycle, and hormones
- ❖ Describe the anatomy and physiology of female and male reproductive systems
- ❖ Describe the phases of the menstrual cycle and what occurs in each phase
- ❖ Explain how fertilization and implantation occur and when during the menstrual cycle a woman can become pregnant.

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## Unit 3: Reproductive Systems and the Menstrual Cycle

### Key Points

- ❖ Understanding the female reproductive cycle is essential for understanding how pregnancy occurs and how family planning methods work to prevent it.
- ❖ The female reproductive cycle involves both the development of an egg in the ovaries (oogenesis) and the preparation of the uterus to receive a fertilized ovum.
- ❖ Sperm can usually live up to 48 hours in the woman's body.
- ❖ A woman is most likely to become pregnant if she has unprotected sex from 2 days before ovulation to the day after ovulation.

### 3.1 Importance of Understanding Human Reproductive Systems

It is essential that family planning providers understand the female and male reproductive systems and female reproductive cycles in order to provide high quality family planning services. To be able to help their clients make informed decisions about family planning methods, instruct clients about how to use their chosen methods, and advise clients about managing side effects, service providers need to understand how pregnancy occurs, when a woman can become pregnant (her fertile time), and how contraceptive methods work. Another benefit of understanding the reproductive cycles is a greater understanding of their roles in female fertility problems and bleeding disorders.

### 3.2 Overview and Definitions

*(Note: This section was adapted from Principles of Anatomy and Physiology, 7<sup>th</sup> edition, by Gerard J Tortora and Sandra Reynolds Grabowski. Copyright 1993, HarperCollins College. Reprinted with permission of John Wiley & Sons, Inc.)*

During their reproductive years, non-pregnant females normally experience a cyclical series of changes in the ovaries and uterus. Each cycle takes about a month and involves both oogenesis (development of an ovum) and preparation of the uterus to receive a fertilized ovum. Hormones control the events in these cycles.

**The ovarian cycle** is a series of events that are involved in the maturation of an ovum, or egg.

**The menstrual (uterine) cycle** is a series of changes in the endometrium (lining) of the uterus. Each month, the endometrium is prepared for the potential arrival of a fertilized ovum that will develop in the uterus. If an ovum is not fertilized, the outer portion of the endometrium sheds off.

**Menstruation** is the shedding of the endometrium accompanied by bleeding. Menstruation starts during puberty (at menarche) and stops permanently at menopause. It is also known as "monthly bleeding," a "period," and menses.

The term **female reproductive cycle** refers to the ovarian and uterine cycles, the hormonal changes that regulate them, and cyclical changes in the breasts and cervix.

**Male and female reproductive systems** include all of the structures and organs involved in fertilization and implantation.

**Hormones** are chemicals produced by glands and structures in the body. Hormones act as chemical messengers to another body structure or gland. Hormones control the events in the menstrual and ovarian cycles.

This unit focuses on the phases of the menstrual cycle, and includes events in the ovarian cycle in the menstrual (uterine) cycle description.

### 3.3 The Female Reproductive System

(**Note:** To save space, illustrations of female and male anatomy are not included here but are reprinted in the Handouts section at the end of this unit.)

#### External female reproductive anatomy

Structures of external female reproductive anatomy include:

- **Pubic hair:** Surrounds the female reproductive organs
- **Clitoris:** Sensitive ball of tissue creating sexual pleasure
- **Labia majora (outer lips):** Two folds of skin, 1 on either side of the vaginal opening, that protect the female organs
- **Labia minora (inner lips):** Two folds of skin, inside the labia majora, that extend from the clitoris
- **Urethra:** Opening where urine leaves the body
- **Vaginal opening:** Where a man's penis is inserted during sex, and where blood flows out during menstruation
- **Anus:** Where solid waste leaves the body.

#### Internal female reproductive anatomy

Primary structures and organs include:

- **Uterus (womb):** Reproductive organ where a fertilized ovum, or egg, grows and develops into a foetus
- **Fallopian tube:** Each of the two tubes that link the ovaries to the uterus. An ovum travels along one of these tubes once a month. Fertilization occurs in this tube.
- **Ovary:** Two reproductive glands where ova (eggs) develop and 1 is released each month
- **Ovarian follicle:** A hollow ball of cells that contains an immature ovum. Located in each ovary
- **Endometrium:** The lining of the uterus, which gradually thickens and then is shed during menstruation
- **Cervix:** Lower portion of the uterus that extends into the upper vagina. It produces mucus.
- **Vagina:** Joins the outer sexual organs with the uterus.

### 3.4 The Male Reproductive System

The primary structures and organs of the male reproductive system include:

- **Penis:** Male sex organ made of spongy tissue

- **Urethra:** Tube through which semen is released from the body. Urine is released through the same tube.
- **Seminal vesicles:** Where sperm is mixed with semen
- **Foreskin:** Hood of skin covering the end of the penis
- **Prostate:** Organ that produces some of the fluid in semen
- **Testicles:** Organs that produce sperm
- **Scrotum:** Sack of thin, loose skin containing the testicles
- **Vas deferens:** Each of the 2 thin tubes that carry sperm from the testicles to the seminal vesicles.

### 3.5 Phases of the Menstrual and Ovarian Cycles

By definition, the menstrual (or uterine) cycle begins with the first day of bleeding, which is counted as day 1. The cycle ends just before the next menstrual period. Menstrual cycles normally range from about 25 to 36 days. The description of the phases of the menstrual cycle below assumes a cycle length of 28 days. However, only 10% to 15% of women have cycles that are exactly 28 days.

The menstrual and ovarian cycles each have 3 phases:

#### **Menstrual cycle**

##### **Days 1-5: Menstrual phase**

- This phase is from first day of the menses to last day of bleeding (usually lasts from 3–5 days, up to 7 days).
- Bleeding occurs when there is no fertilization.
- Low levels of both progesterone and oestrogen make the blood vessels of the endometrium constrict, cutting off blood flow to the uterine lining.
- The cells of the uterine lining start to die, and the lining sloughs off and causes bleeding.
- Two-thirds of the endometrial lining sheds during menses.
- During this time the ovaries are beginning the follicular stage (see below).

##### **Days 6-14: Proliferative phase**

- This phase is from cessation of menses to ovulation.
- Endometrial lining thickens in preparation for implantation of a fertilized ovum. Its thickness doubles to about 4–6 mm.
- Uterine secreting glands increase in size and produce mucus.
- Uterine blood vessels begin to grow.
- Ovulation occurs in the ovaries at the end of this stage, usually around day 14, triggered by a surge in luteinizing hormone (LH) from the anterior pituitary gland.

##### **Days 15-28: Secretory phase**

- This phase is from ovulation to the start of the next menses.
- Endometrial glands secrete mucus, which prepares the uterus to receive a fertilized ovum.
- The corpus luteum produces oestrogen, while the cells of the ovaries produce progesterone.

- Endometrium continues to thicken.

### **Ovarian cycle:**

While the uterus is proceeding through the 3 phases above, the ovaries pass through the following phases:

- **Follicular phase:** (about 14 days): Between 3-30 follicles, each containing 1 ovum (egg), begin to grow, with usually 1 reaching maturity while the others break down.
- **Ovulatory phase** (about 16-32 hours): The ovum is released from the follicle and enters the Fallopian tube.
- **Luteal phase** (about 14 days): The ruptured follicle forms a structure called the corpus luteum. The corpus luteum produces progesterone, which helps prepare the endometrium for a fertilized egg.

## **3.6 Fertilization and Implantation**

Once the egg is released from the ovary (ovulation), it can live for about 24 hours. Once sperm move up the female reproductive tract (through the cervix and into the uterus) after ejaculation, they can usually live for about 48 hours. Fertilization, when the egg joins with the sperm and forms the oocyte, usually happens within 24 hours of intercourse. The fertilized oocyte then implants into the endometrium by 5-7 days after fertilization.

Following implantation:

- The developing placental tissues secrete chorionic gonadotropine, a hormone that helps maintain pregnancy, which maintains the corpus luteum.
- The corpus luteum of pregnancy, as this is now called, produces the oestrogens and progesterone required to maintain the pregnancy until the placenta takes over this function.

If the ovum is not fertilized by a sperm, the corpus luteum regresses, levels of oestrogens and progesterone drop off, the endometrium begins to slough off and pass through the vagina, and menstruation begins the reproductive cycle again.

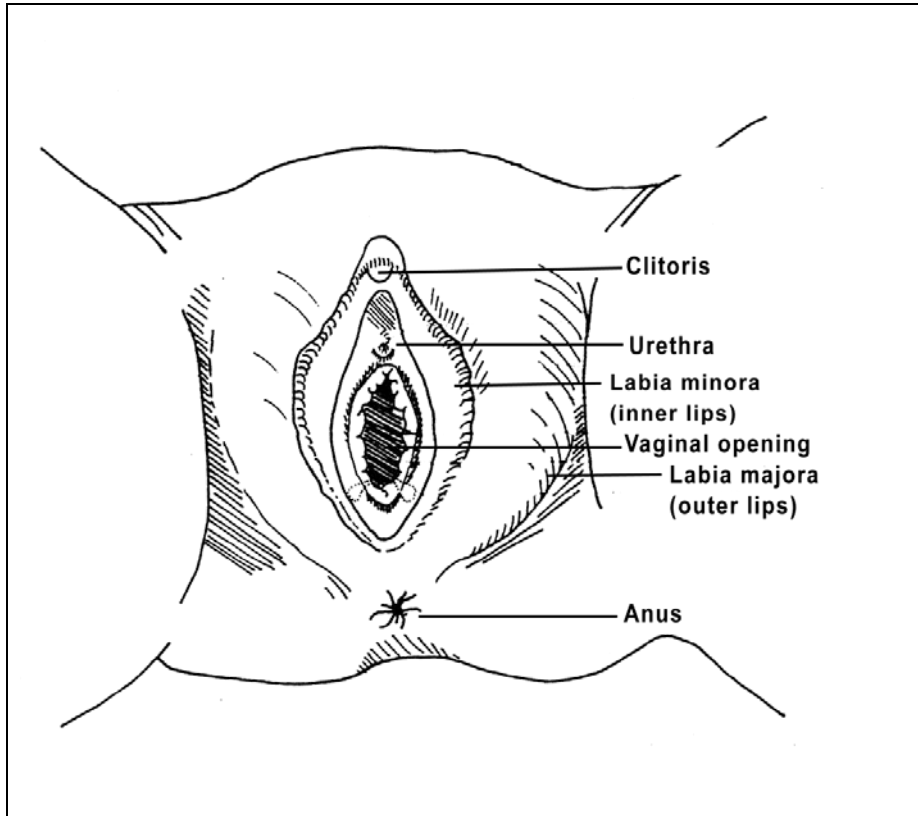
## **3.7 Fertile Days of the Menstrual Cycle**

A woman's fertile days depend on ovulation as well as the life span of the egg and the sperm. The egg and sperm are most likely to join, and pregnancy is most likely to occur, when unprotected sexual intercourse takes place during the 2 days before ovulation or on the day of ovulation. It is also possible a day or 2 after ovulation—although this is less likely.

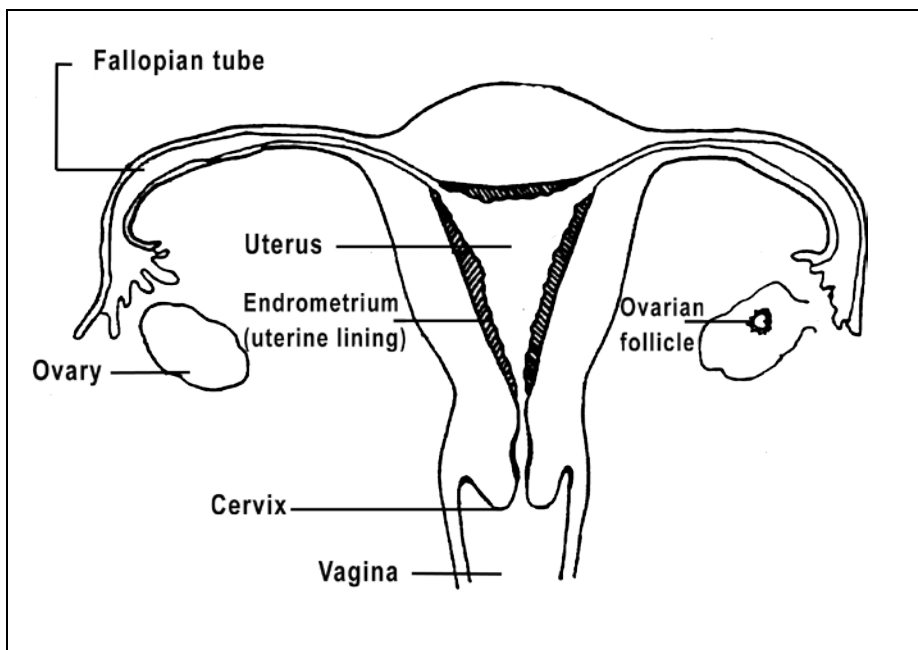
Most women ovulate between 11 and 18 days after the first day of their last period. This is the time when women are most fertile and most likely to get pregnant. But the time of ovulation can be different from month to month and different between different women. Therefore, a woman could potentially become pregnant if she has unprotected sex on most days of her menstrual cycle.

Handouts

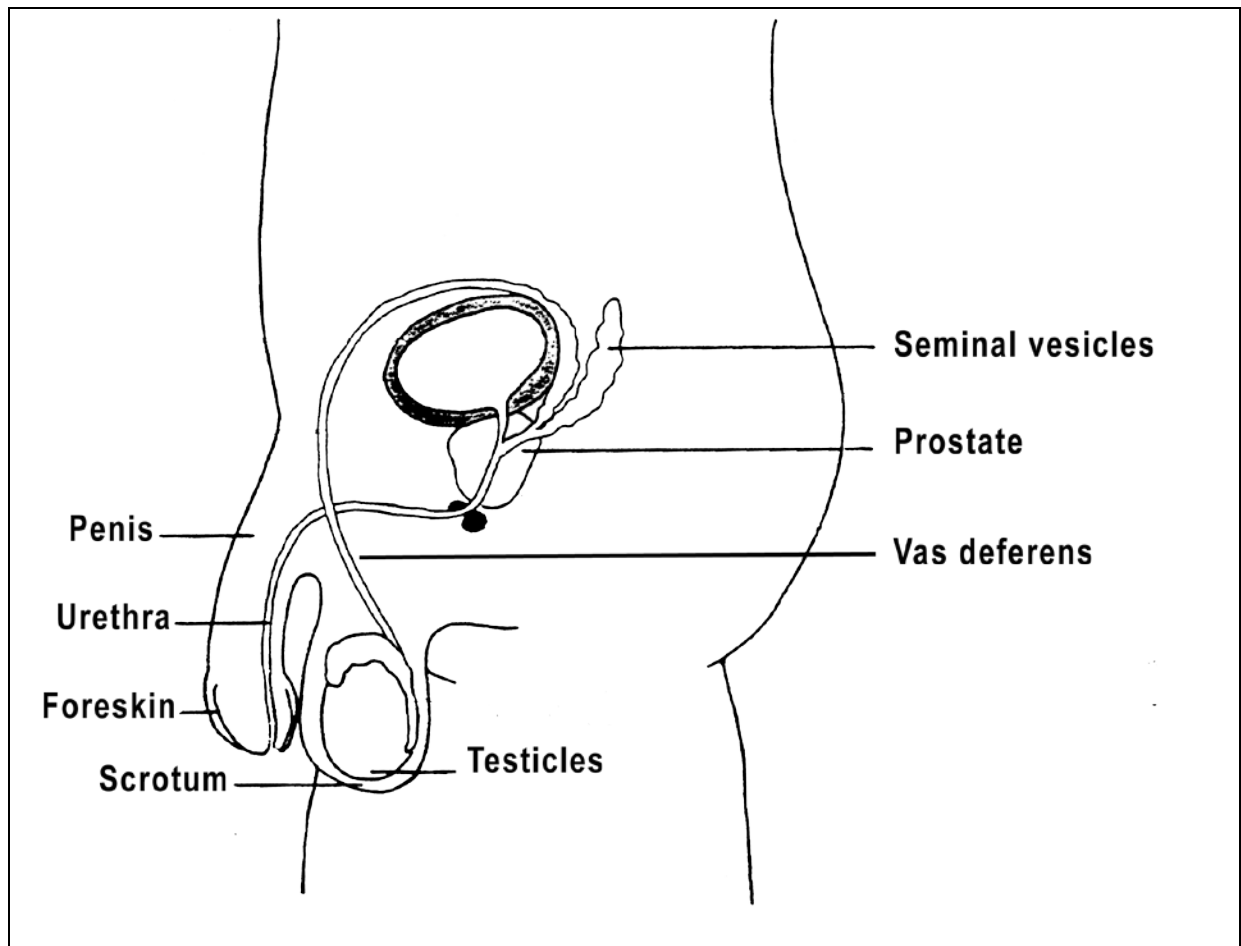
**External Female Reproductive Anatomy**



**Internal Female Reproductive Anatomy**



## Male Reproductive Anatomy



## Reproductive Systems Quiz Questions

**Questions 1–9 :** Indicate whether the following statements about the reproductive systems are true or false by writing a “T” for true or an “F” for false in the space provided before each statement.

- \_\_\_ 1. Proteins control the changes in the ovaries and uterus associated with the reproductive cycle.
- \_\_\_ 2. The urethra is a tube through which semen is released from the body.
- \_\_\_ 3. The vas deferens are 2 thin tubes that carry sperm from the seminal vesicles to the testicles.
- \_\_\_ 4. Fertilization occurs in the uterus.
- \_\_\_ 5. The menstrual cycle begins with the first day of bleeding.
- \_\_\_ 6. The majority of women have menstrual cycles that last 28 days.
- \_\_\_ 7. Blood pools in the uterus during the month and is released during the menstrual phase of the menstrual cycle.
- \_\_\_ 8. During the proliferative phase of the menstrual cycle, endometrial glands secrete mucus, which prepares the uterus to receive a fertilized ovum.
- \_\_\_ 9. Fertilization is most likely to occur when unprotected sexual intercourse happens during the 2 days before ovulation or on the day of ovulation.

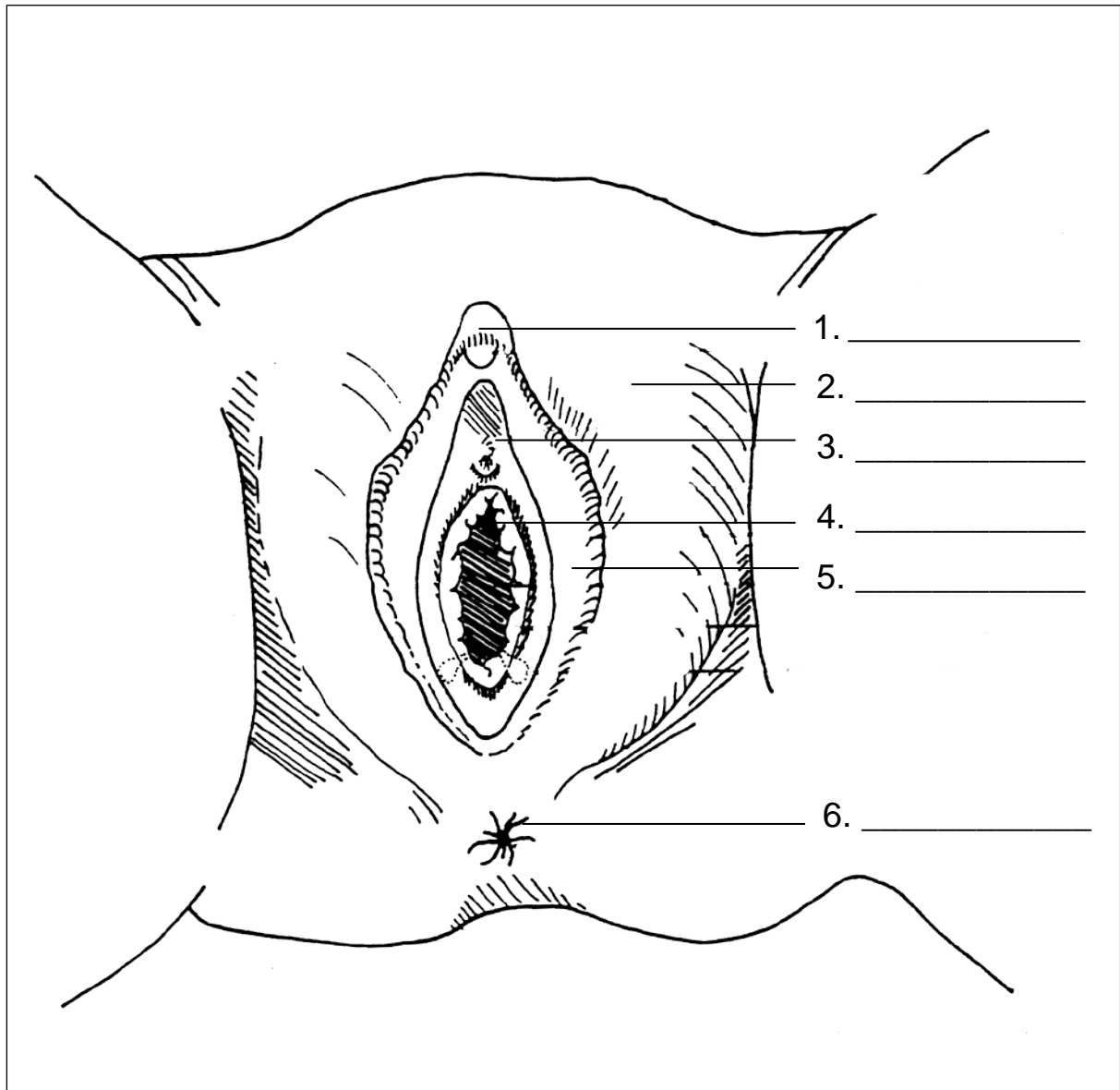
**Questions 10–15 :** Please fill in the blank spaces to complete the following sentences.

- 10. After ovulation, the ovum normally lives for \_\_\_\_\_ (length of time) in the reproductive tract.
- 11. After ejaculation, sperm normally survive \_\_\_\_\_ (length of time) in the female reproductive tract.
- 12. If an ovum is fertilized, it continues to travel down the \_\_\_\_\_ toward the \_\_\_\_\_.
- 13. A fertilized ovum implants into the \_\_\_\_\_ about \_\_\_\_\_ days after fertilization.
- 14. At the end of the proliferative phase, \_\_\_\_\_ occurs in the ovaries.
- 15. The phases of the menstrual cycle, in the order in which they occur, are \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.



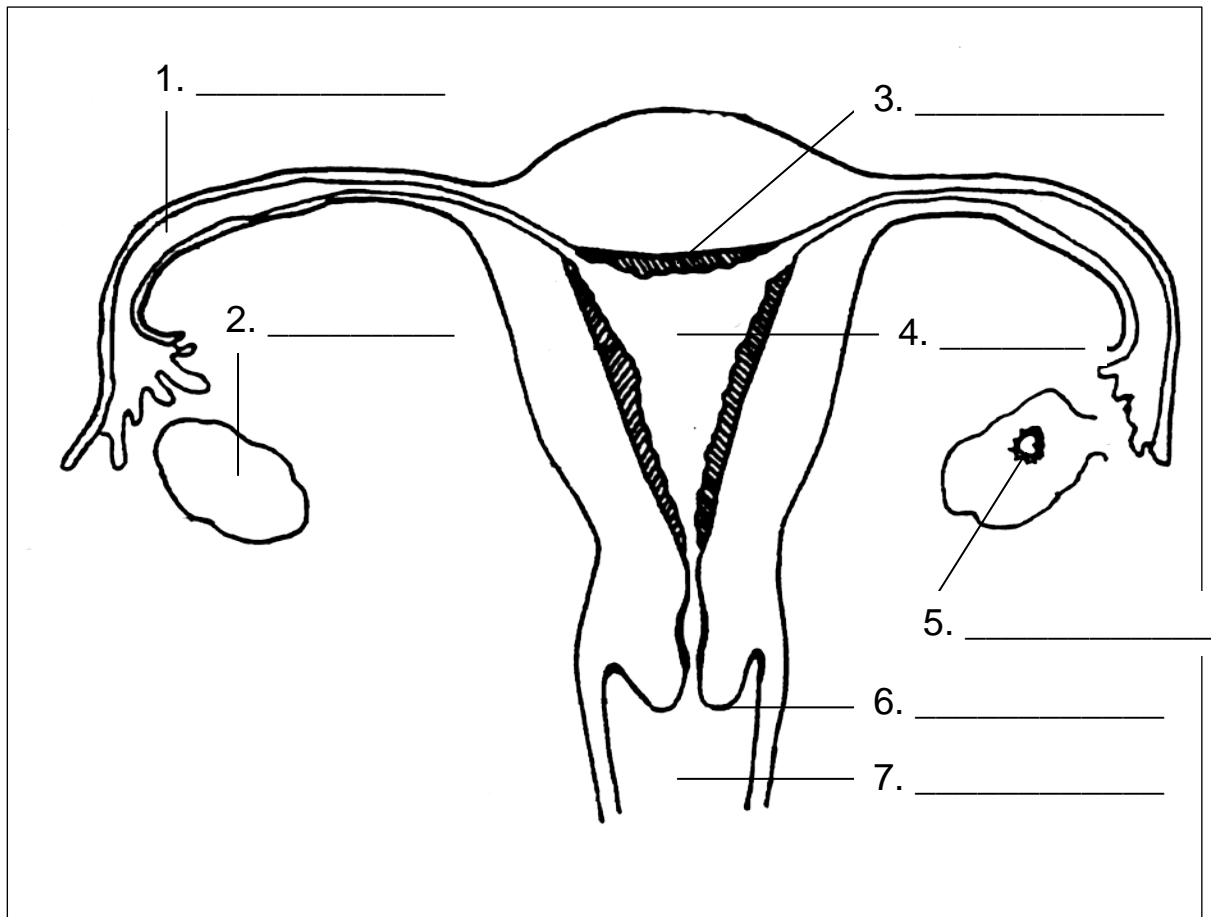
## External Female Reproductive Anatomy Assessment

Label the major structures in this illustration:



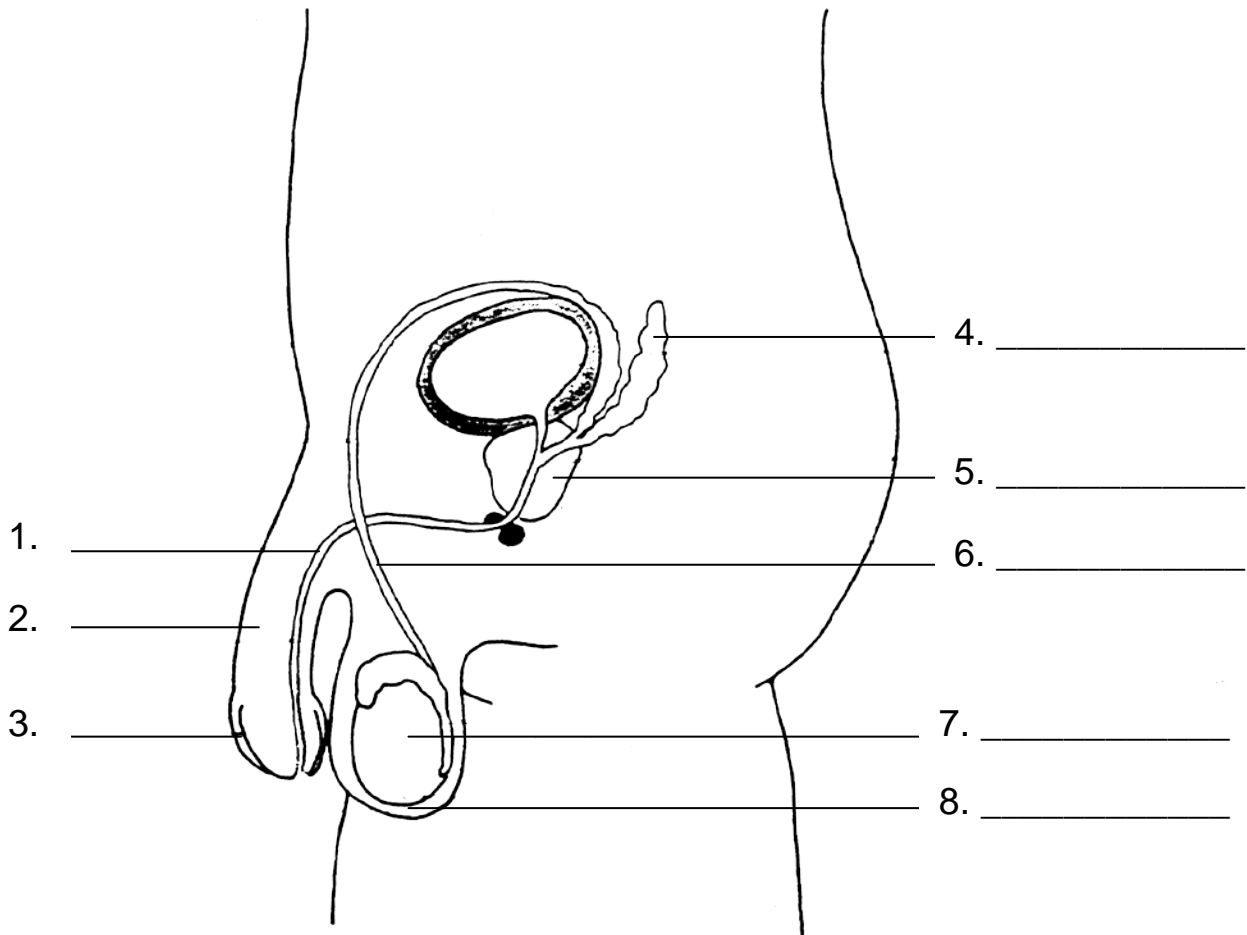
## Internal Female Reproductive Anatomy Assessment

Label the major organs and structures in this illustration:



## Male Reproductive Anatomy Assessment

Label all the major reproductive structures and organs in this illustration:



## Reproductive Systems Quiz Questions Answer Key

- F** \_\_ 1. Proteins control the changes in the ovaries and uterus associated with the reproductive cycle.
- T** \_\_ 2. The urethra is a tube through which semen is released from the body.
- F** \_\_ 3. The vas deferens are 2 thin tubes that carry sperm from the seminal vesicles to the testicles.
- F** \_\_ 4. Fertilization occurs in the uterus.
- T** \_\_ 5. The menstrual cycle begins with the first day of bleeding.
- F** \_\_ 6. The majority of women have menstrual cycles that last 28 days.
- F** \_\_ 7. Blood pools in the uterus during the month and is released during the menstrual phase of the menstrual cycle.
- F** \_\_ 8. During the proliferative phase of the menstrual cycle, endometrial glands secrete mucus, which prepares the uterus to receive a fertilized ovum.
- T** \_\_ 9. Fertilization is most likely to occur when unprotected sexual intercourse happens during the 2 days before ovulation or on the day of ovulation.
10. After ovulation, the ovum normally lives for **24 hours** (length of time) in the reproductive tract.
11. After ejaculation, sperm normally survive **2 days** (length of time) in the female reproductive tract.
12. If an ovum is fertilized, it continues to travel down the **Fallopian tube** toward the **uterus**.
13. A fertilized ovum implants into the **endometrium** about **5-7** days after fertilization.
14. At the end of the proliferative phase, ovulation occurs in the ovaries.
15. The phases of the menstrual cycle, in the order in which they occur, are **menstrual phase**, **proliferative phase**, and **secretory phase**.

# Anatomy Assessment Answer Key

## **External female reproductive anatomy**

1. clitoris
2. labia majora (outer lips)
3. urethra
4. vagina
5. labia minora (inner lips)
6. anus

## **Internal female reproductive anatomy**

1. Fallopian tube
2. ovary
3. endometrium
4. uterus
5. ovarian follicle
6. cervix
7. vagina

## **Male reproductive anatomy**

1. urethra
2. penis
3. foreskin
4. seminal vesicles
5. prostate
6. vas deferens
7. testicles
8. scrotum

## References

Ministry of Health. 2007. Malawi national reproductive health service delivery guidelines. Lilongwe, Malawi: Ministry of Health.

Marieb, Elaine N. 2000. *Essentials of human anatomy and physiology*. 6th ed. San Francisco, CA: Benjamin/Cummings.

Tortora, Gerard J. and Sandra Reynolds Grabowski. 1993. *Principles of anatomy and physiology*. 7th ed. New York, NY: HarperCollins College.

World Health Organization/Department of Reproductive Health and Research (WHO/RHR) and Johns Hopkins Bloomberg School of Public Health/Center for Communications Programs (CCP), Knowledge for Health Project. *Family Planning: A global handbook for providers (2008 update)*. Baltimore and Geneva: CCP and WHO/RHR.  
<http://info.k4health.org/globalhandbook/>