

The Male and Female Reproductive Systems

Objectives

After this, students will be able to

D.7.2.1 Define sexual reproduction.

D.7.2.2 Describe the structures and functions of the male reproductive system.

D.7.2.3 Describe the structures and functions of the female reproductive system.

D.7.2.4 Sequence the events that occur during the menstrual cycle.

Target Reading Skill

Sequencing Explain that organizing information from beginning to end helps students understand a step-by-step process.

Answers

The Menstrual Cycle

Days 1–4 Menstrual discharge

Days 5–13 Developing egg

Days 14–15 Ovulation

Days 16–22 Egg moves through oviduct

Days 23–28 Egg enters uterus

All in One Teaching Resources

- Transparency D62

Preteach

Build Background Knowledge

L2

Reproductive Systems

Organize students in small discussion groups and have them brainstorm lists of things they think they already know about the male and female reproductive systems. Use these lists as students study the chapter to address any misconceptions they may have.

The Male and Female Reproductive Systems

Reading Preview

Key Concepts

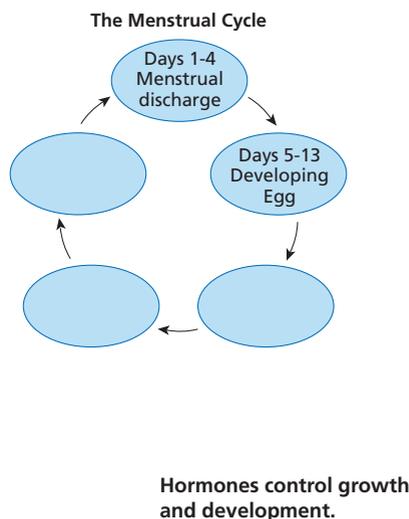
- What is sexual reproduction?
- What are the structures and functions of the male and female reproductive systems?
- What events occur during the menstrual cycle?

Key Terms

- egg • sperm • fertilization
- zygote • testis • testosterone
- scrotum • semen • penis
- ovary • estrogen
- fallopian tube • uterus
- vagina • menstrual cycle
- ovulation • menstruation

Target Reading Skill

Sequencing As you read, make a cycle diagram like the one below that shows the menstrual cycle. Write each event of the process in a separate circle.



486 ♦

Lab zone

Discover Activity

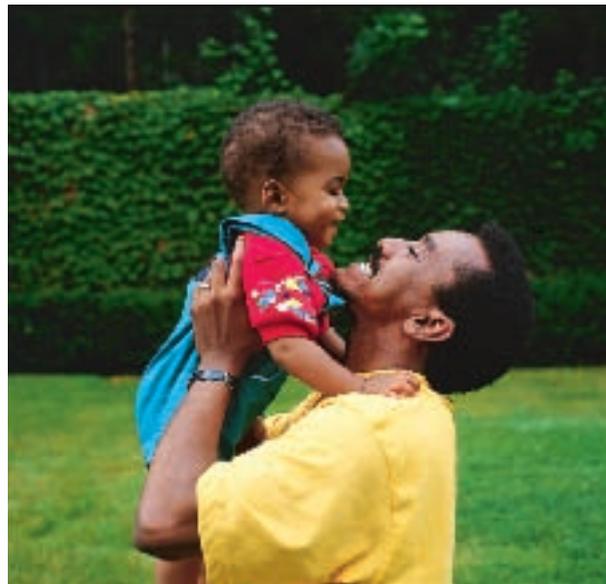
What's the Big Difference?

1. Your teacher will provide prepared slides of eggs and sperm.
2. Examine each slide under the microscope, first under low power, then under high power. Be sure you view at least one sample of egg and sperm from the same species.
3. Sketch and label each sample.

Think It Over

Observing What differences did you observe between sperm cells and egg cells? What general statement can you make about eggs and sperm?

Many differences between an adult animal and its young are controlled by the endocrine system. In humans, two endocrine glands—the ovaries and the testes—control many of the changes that occur as a child matures. These glands release hormones that cause the body to develop as a person grows older. They also produce sex cells that are part of sexual reproduction.



Lab zone

Discover Activity

Skills Focus Observing

L2

Materials slides of human egg and sperm cells, microscope

Time 20 minutes

Tips Students may need help focusing the microscope and finding the egg and sperm cells. Encourage them to begin at low power before switching to high power.

Think It Over Sperm cells are much smaller than egg cells and have long tail-like parts. Eggs are round, usually much larger than sperm from the same species, and do not have tails.

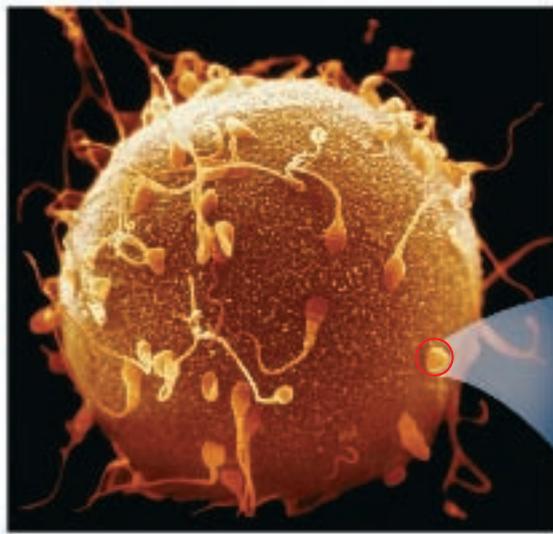
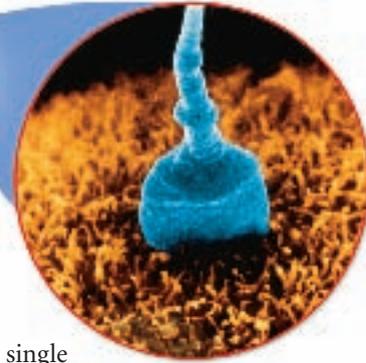


FIGURE 5
Egg and Sperm

An egg is one of the largest cells in the body. A sperm, which is much smaller than an egg, has a head (rounded end) and a tail that allows it to move. In the photograph on the left, sperm are swarming around the large egg. On the right, a sperm, which has been colored blue, has penetrated the egg. **Applying Concepts** What structure results when the sperm fertilizes the egg?



Sexual Reproduction

You may find it hard to believe that you began life as a single cell. That single cell was produced by the joining of two other cells, an egg and a sperm. An **egg** is the female sex cell. A **sperm** is the male sex cell.

The joining of a sperm and an egg is called **fertilization**. Fertilization is an important part of sexual reproduction, the process by which male and female living things produce new individuals. **Sexual reproduction involves the production of eggs by the female and sperm by the male. The egg and sperm join together during fertilization.** When fertilization occurs, a fertilized egg, or **zygote**, is produced. Every one of the trillions of cells in your body is descended from the single cell that formed during fertilization.

Like other cells in the body, sex cells contain rod-shaped structures called chromosomes. Chromosomes (KROH muh sohms) carry the information that controls inherited characteristics, such as eye color and blood type. Every cell in the human body that has a nucleus, except the sex cells, contains 46 chromosomes. Each sex cell contains half that number, or 23 chromosomes. During fertilization, the 23 chromosomes in a sperm join the 23 chromosomes in an egg. The result is a zygote with 46 chromosomes. The zygote contains all of the information needed to produce a new human being.



Reading Checkpoint What happens to the number of chromosomes when a male sex cell and a female sex cell join?

Instruct

Sexual Reproduction

Teach Key Concepts

L2

Fertilization

Focus Have students locate a period at the end of a sentence in the text. Explain that everyone began life from a single cell that was about that size.

Teach Explain that trillions of cells result from a single fertilized cell. Ask: **What is that single cell called?** (*A zygote*) **How did it form?** (*Through fertilization, in which an egg from a female and sperm from a male joined*)

What is that process called? (*Sexual reproduction*) Have students refer to Figure 6 and read the caption. Ask: **How do the two sex cells differ?** (*The egg cell is larger, while the sperm cell has a tail that enables it to move.*) Point out that a human sperm and egg cell each have 23 chromosomes so that when they join, every cell from then on will have 46 chromosomes, except the sex cells.

Apply Ask: **Why do the two sex cells differ in form?** (*The sperm must travel to the egg to allow for fertilization. The egg must have a food supply.*) **learning modality: visual**

Independent Practice

L2

All in One Teaching Resources

- Guided Reading and Study Worksheet: *The Male and Female Reproductive Systems*



Student Edition on Audio CD

Differentiated Instruction

Less Proficient Readers

L1

Organizing Information As students read, have them list the differences between the male and female reproductive systems in a table such as the one shown. When they have finished reading the section, ask: **What is the function of ovaries?** (*Produce eggs*) **Why are the testes located outside the body?** (*Sperm need cooler temperatures.*) **learning modality: verbal**

Characteristic	Male	Female
Sex cell	sperm	egg
Organs	testes	ovaries
Hormones	testosterone	estrogen

Monitor Progress

L2

Drawing Ask students to draw a diagram showing how a zygote is formed and how it has 46 chromosomes.

Answers

Figure 5 Zygote



The number of chromosomes is restored to 46, the number typical of human body cells.

Male Reproductive System

Teach Key Concepts

L2

Structures of the Male Reproductive System

Focus Review with students that sperm cells are produced by the male reproductive system.

Teach Refer students to Figure 6. Explain that hundreds of coiled tubes in the testes produce and store sperm cells and produce testosterone. Ask: **What does this hormone do?** (*It controls the development of physical characteristics in men.*) Explain that the scrotum helps the testes maintain a temperature 2–3°C below the usual body temperature. Ask: **Why is the location of the scrotum important?** (*Sperm need slightly cooler conditions to develop normally.*)

Apply Ask: **What might happen if a man has a high fever for a long time?** (*Sperm might not develop properly.*) **learning modality: verbal**

All in One Teaching Resources

- Transparency D63

Male Reproductive System

The organs of the male reproductive system are shown in Figure 6. **The male reproductive system is specialized to produce sperm and the hormone testosterone.** The structures of the male reproductive system include the testes, scrotum, and penis.

The Testes The oval-shaped **testes** (TES teez) (singular *testis*) are the organs of the male reproductive system in which sperm are produced. The testes consist of clusters of hundreds of tiny coiled tubes and the cells between the tubes. Sperm are formed inside the tubes.

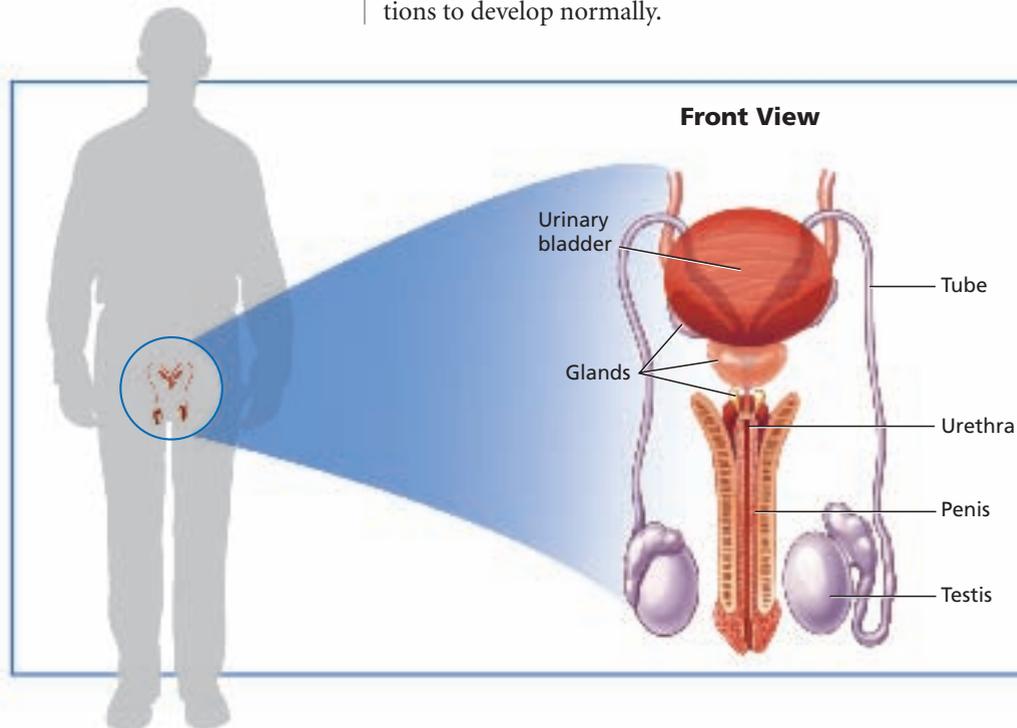
The testes also produce testosterone. **Testosterone** (tes TAHStuh rohn) is a hormone that controls the development of physical characteristics in mature men. Some of those characteristics include facial hair, deepening of the voice, broadening of the shoulders, and the ability to produce sperm.

Notice in Figure 6 that the testes are located in an external pouch of skin called the **scrotum** (SKROH tum). The external location keeps the testes about 2°C to 3°C below 37°C, which is the usual temperature within the body. That temperature difference is important. Sperm need the slightly cooler conditions to develop normally.

FIGURE 6
The Male Reproductive System

In the male reproductive system, the testes produce sperm and the hormone testosterone.

Interpreting Diagrams Trace the pathway of sperm in the male reproductive system. What structures does a sperm cell pass through before exiting the body?

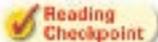


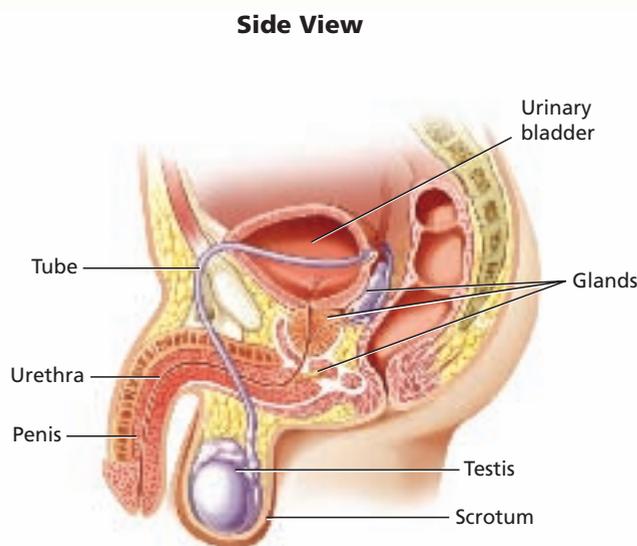
488 ◆

Sperm Production The production of sperm cells begins in males at some point during the teenage years. Each sperm cell is composed of a head that contains chromosomes and a long, whiplike tail. Basically, a sperm cell is a tiny package of chromosomes that can swim.

The Path of Sperm Cells Once sperm cells form in the testes, they travel through other structures in the male reproductive system. During this passage, sperm mix with fluids produced by nearby glands. This mixture of sperm cells and fluids is called **semen** (SEE mun). Semen contains a huge number of sperm—about 5 to 10 million per drop! The fluids in semen provide an environment in which sperm are able to swim. Semen also contains nutrients that the moving sperm use as a source of energy.

Semen leaves the body through an organ called the **penis**. The tube in the penis through which the semen travels is called the urethra. Urine also leaves the body through the urethra. When semen passes through the urethra, however, muscles near the bladder contract. Those muscles prevent urine and semen from mixing.

 **Reading Checkpoint** What is the pouch of skin in which the testes are located?



Chapter 13 ♦ 489



For: Links on the reproductive system
Visit: www.SciLinks.org
Web Code: scn-0472



For: Links on the reproductive system
Visit: www.SciLinks.org
Web Code: scn-0472

Download a worksheet that will guide students' review of the reproductive system.



Comparing and Contrasting the Male and Female Reproductive Systems

Materials reference books or online sources of information

Time 20 minutes

Focus After discussing the female reproductive system on the next two pages, briefly review the structures of both reproductive systems.

Teach Use the text and additional sources to gather information on the similarities and differences between the functions of the ovaries and the testes.

Apply Students can then use the information to develop compare-and-contrast tables. Invite students to share their tables with the class. **learning modality:** verbal

Monitor Progress L2

Have students draw concept maps describing the production and path of sperm. Students can save the concept maps in their portfolios. 

Answers

Figure 6 From the testis, through the tube and then the urethra in the penis

 **Reading Checkpoint** Scrotum

Female Reproductive System

Teach Key Concepts

L2

Structures of the Female Reproductive System

Focus Review with students that egg cells are produced by the female reproductive system.

Teach Explain that the ovaries produce the egg cells and that ovaries are the endocrine glands that produce estrogen, the female hormone. Ask: **How is the function of estrogen like the function of testosterone?** (*Estrogen triggers the female characteristics to develop; testosterone plays a similar role in males.*) Explain that other structures of the female reproductive system function to move the egg cell for fertilization, support a fertilized egg, or remove an unfertilized egg from the body. Ask: **What are fallopian tubes?** (*Passageways for eggs as they travel from the ovary to the uterus*) **What is the function of the uterus?** (*To hold a fertilized egg through its development*)

Apply Ask: **How is the function of the female reproductive system different from that of the male?** (*The female system is structured to contain and nourish a developing baby until birth.*) **learning modality: verbal**

All in One Teaching Resources

- Transparency D64

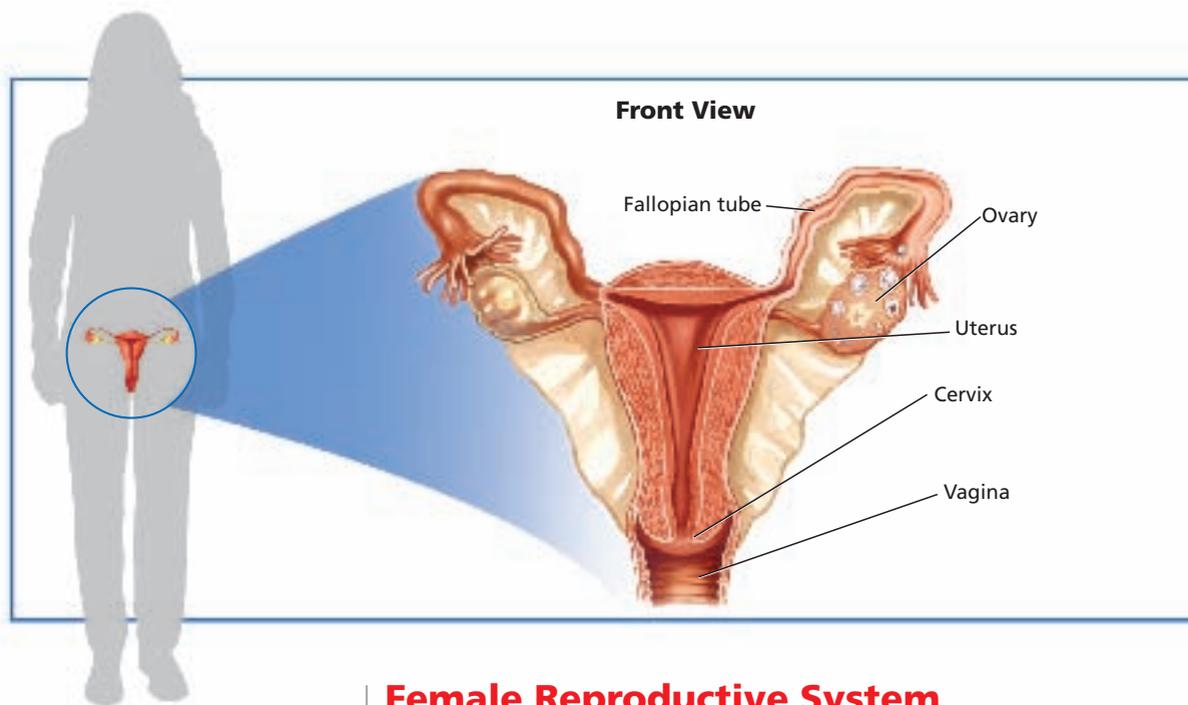


FIGURE 8
Female Reproductive System

In the female reproductive system, the two ovaries produce eggs and hormones such as estrogen.

Relating Cause and Effect *What changes does estrogen produce in a female's body?*

Female Reproductive System

Figure 8 shows the female reproductive system. **The role of the female reproductive system is to produce eggs and, if an egg is fertilized, to nourish a developing baby until birth. The organs of the female reproductive system include the ovaries, fallopian tubes, uterus, and vagina.**

The Ovaries The ovaries (OH vuh reez) are the female reproductive structures that produce eggs. The ovaries are located slightly below the waist, one ovary on each side of the body. The name for these organs comes from the Latin word *ova*, meaning “eggs.”

Female Hormones Like the testes in males, the ovaries also are endocrine glands that produce hormones. One hormone, **estrogen** (ES truh jun), triggers the development of some adult female characteristics. For example, estrogen causes the hips to widen and the breasts to develop. Estrogen also plays a role in the process by which egg cells develop.

The Path of the Egg Cell Each ovary is located near a fallopian tube. The **fallopian tubes**, also called oviducts, are passageways for eggs as they travel from the ovary to the uterus. Each month, one of the ovaries releases a mature egg, which enters the nearest fallopian tube. Fertilization usually occurs within a fallopian tube.

490 ◆

Differentiated Instruction

Less Proficient Readers

Remembering Vocabulary Encourage students to create a list of terms and definitions in this section. They can make flash cards with the terms on one side and the definitions on the other, then work in pairs to quiz each other. Encourage students to refer to the diagrams often to visualize the meaning of the terms.
learning modality: verbal

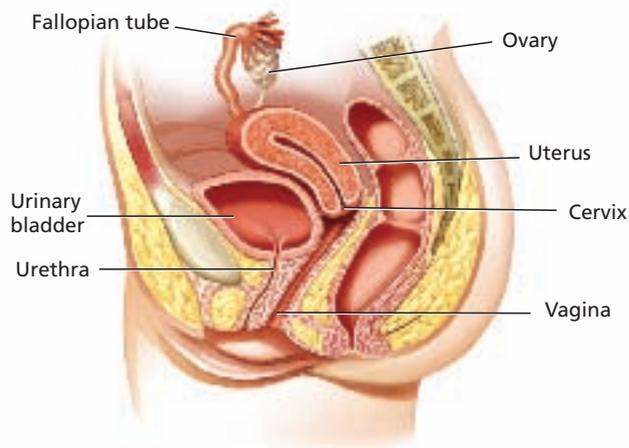
L1

Gifted and Talented

Interpreting Health Information Ask students to use reliable sources, including their family doctors, to find out what causes painful menstrual cramps (*Chemicals called prostaglandins*) and how cramps can be treated. Have students share their findings with teen girls in the class. **learning modality: verbal**

L3

Side View



The egg moves through the fallopian tube, which leads to the uterus. The **uterus** (YOO tur us) is a hollow muscular organ about the size of a pear. If an egg has been fertilized, it becomes attached to the wall of the uterus.

An egg that has not been fertilized starts to break down in the uterus. It leaves the uterus through an opening at the base of the uterus, called the cervix. The egg then enters the vagina. The **vagina** (vuh JY nuh) is a muscular passageway leading to the outside of the body. The vagina, or birth canal, is the passageway through which a baby leaves the mother's body.



What is the role of the fallopian tube?

The Menstrual Cycle

When the female reproductive system becomes mature, usually during the teenage years, there are about 400,000 undeveloped eggs in the ovaries. However, only about 500 of those eggs will actually leave the ovaries and reach the uterus. An egg is released about once a month in a mature woman's body. The monthly cycle of changes that occur in the female reproductive system is called the **menstrual cycle** (MEN stroo ul).

During the menstrual cycle, an egg develops in an ovary. At the same time, the uterus prepares for the arrival of an embryo. In this way, the menstrual cycle prepares the woman's body for pregnancy, which begins after fertilization.

Lab zone Skills Activity

Calculating

An egg is about 0.1 mm in diameter. In contrast, the head of a sperm is about 0.005 mm. Calculate how much bigger an egg is than a sperm.

Chapter 13 ♦ 491

Lab zone Skills Activity

Skills Focus Calculating
Materials calculator (optional)

Time 5 minutes

Tips Some students may not know how to set up the expression to calculate an answer. Give them a hint by pointing out that a sperm's diameter is smaller than an egg's, so they want an answer that tells how many sperm diameters will fit into an egg diameter.

L2 Expected Outcome An egg's diameter is twenty times larger than that of a sperm (0.1 mm / 0.005 mm).

Extend Challenge students to model the sizes of a sperm cell and an egg cell using circles of paper, by choosing an appropriate scale and making the models.
learning modality: logical/mathematical

The Menstrual Cycle

Teach Key Concepts

L2

Stages of the Menstrual Cycle

Focus Remind students that one of the roles of the female reproductive system is to nourish a developing baby.

Teach Define the menstrual cycle, and explain that during this cycle two things happen: An egg develops in an ovary, and the uterus prepares for a fertilized egg. Refer students to Figure 9. Point out that the first day of a menstrual cycle is the first day of menstruation. Ask: **What is happening at the same time the lining of the uterus begins to thicken?** (*An egg starts to mature in the ovary*) **At what point can the egg be fertilized?** (*About halfway through the cycle, for a few days after the egg is released*) **What would prevent the cycle from beginning again?** (*If the egg is fertilized, the cycle will be interrupted.*)

Apply Tell students that the length of the menstrual cycle varies among women. The average is 28 days. A cycle is still considered normal if it ranges from 22 to 35 days, if that is typical of an individual. **learning modality: visual**

All in One Teaching Resources

- Transparency D65

Monitor Progress

L2

Oral Presentation Call on students to explain the processes that take place during the menstrual cycle on different days of the cycle.

Answers

Figure 7 Estrogen triggers the development of some adult female characteristics and plays a role in the development of egg cells.



Passageway for eggs as they travel from ovary to uterus, and usual location for fertilization

Address Misconceptions

Confusing Concepts and Terminology

Focus Many students may confuse the term *menstrual cycle* with the term *menstruation*.

Teach Explain that the menstrual cycle includes the maturation of the egg, the thickening of the uterine lining, the release of the egg, and the breakdown of the uterine lining, as well as menstruation. Menstruation describes the process by which the blood and tissue of the lining exit the body.

Apply Ask: **During which part of the menstrual cycle does menstruation take place?** (*During the first four days of the cycle*)

Explain that menstruation may last longer for some women and that differences in the length of menstruation are normal.

learning modality: verbal

Math Analyzing Data

Math Skills Making and interpreting graphs

Focus Remind students that hormones in addition to estrogen are involved in the menstrual cycle.

Teach Explain that the horizontal axis represents the time period in days of the menstrual cycle. The vertical axis represents the amount of a particular female hormone that is present. Together, the information can be used to show variances in the levels of the hormone during the menstrual cycle.

Answers

1. Level of LH
2. About 2, 12, 12
3. About 56
4. Day 13; ovulation occurs

Stages of the Menstrual Cycle Follow the stages of the menstrual cycle in Figure 9. The menstrual cycle begins when an egg starts to mature in one of the ovaries. At the same time, the lining of the uterus begins to thicken. About halfway through a typical menstrual cycle, the mature egg is released from the ovary into a fallopian tube in a process called **ovulation** (ahv yuh LAY shun).

Once the egg is released, it can be fertilized for the next few days if sperm are present in the fallopian tube. If the egg is not fertilized, it begins to break down. The lining of the uterus also breaks down. The extra blood and tissue of the thickened lining pass out of the body through the vagina in a process called **menstruation** (men stroo AY shun). On average, menstruation lasts about four to six days. At the same time that menstruation takes place, a new egg begins to mature in the ovary, and the cycle continues.

Endocrine Control The menstrual cycle is controlled by hormones of the endocrine system. Hormones also trigger a girl's first menstruation. Many girls begin menstruation sometime between the ages of 10 and 14 years. Some girls start earlier, while others start later. Women continue to menstruate until about the age of 50. At around that age, the production of sex hormones drops. As a result, the ovaries stop releasing mature egg cells.



How often is an egg released from an ovary?

Math Analyzing Data

Hormone Levels

A woman's hormone levels change throughout the menstrual cycle. The graph shows the levels of one female hormone, known as LH, during the menstrual cycle.

1. **Reading Graphs** What data are represented by the *y*-axis?
2. **Interpreting Data** What is the level of LH on days 1, 17, and 21?
3. **Calculating** What is the difference between LH levels on days 9 and 13?
4. **Drawing Conclusions** On what day does LH reach its highest level? What event takes place at about the same time?

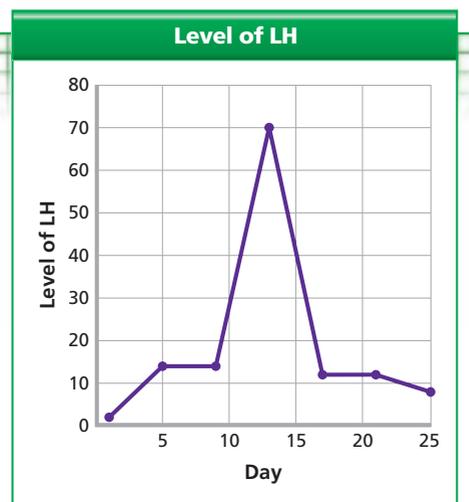
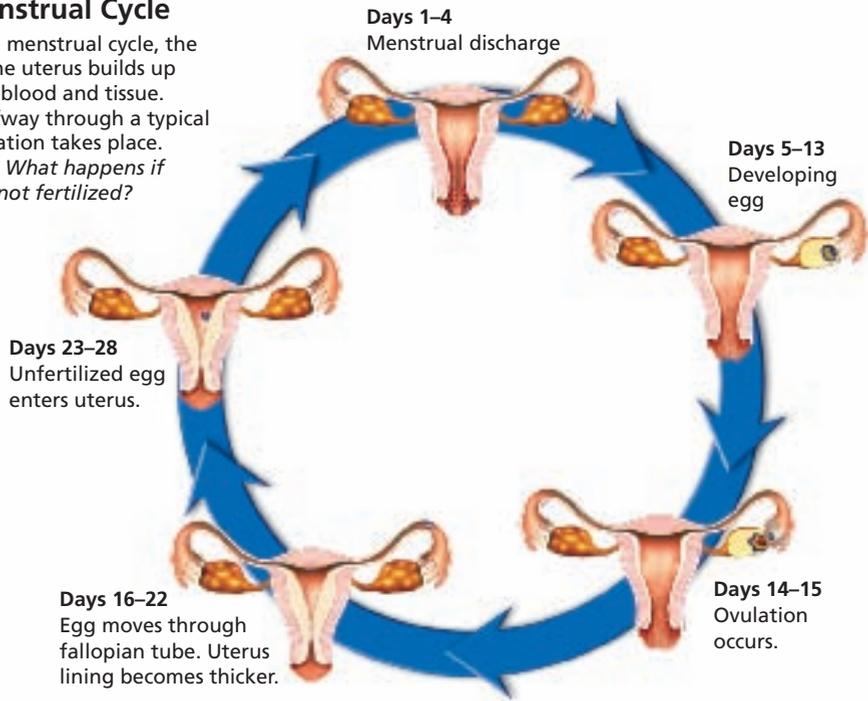


FIGURE 9

The Menstrual Cycle

During the menstrual cycle, the lining of the uterus builds up with extra blood and tissue. About halfway through a typical cycle, ovulation takes place.

Predicting What happens if the egg is not fertilized?



Section 2 Assessment

Target Reading Skill Sequencing Refer to your cycle diagram about the menstrual cycle as you answer Question 3.

Reviewing Key Concepts

- Reviewing** What is fertilization?
 - Explaining** Explain how fertilization produces a new individual.
 - Comparing and Contrasting** Contrast the number of chromosomes in sex cells and in a zygote. Explain why the zygote has the number of chromosomes that it does.
- Listing** List the structures of the male and female reproductive systems.
 - Describing** Describe the functions of the structures you named in Question 2a.

- Comparing and Contrasting** In what ways are the functions of the ovaries and the testes similar? How do their functions differ?
- Defining** What is the menstrual cycle?
 - Sequencing Events** At what point in the menstrual cycle does ovulation occur?

Writing in Science

Explanatory Paragraph Write a paragraph explaining why the ovaries and testes are part of both the endocrine system and the reproductive system.

Chapter 13 ♦ 493

Writing in Science

Writing Skill Exposition Scoring Rubric

- 4** Includes detailed explanations of the roles each system plays in reproduction and hormone production
- 3** Includes correct explanations, but lacks some details
- 2** Includes incomplete explanations
- 1** Includes inaccurate explanations

Lab zone Chapter Project

Keep Students on Track Check that students are continuing to care for their “babies.” They must perform all tasks and write in their journals each day. You may want to set aside some time for discussions in which students compare child-care experiences and give each other pointers.

Monitor Progress L2

Answers

Figure 9 The egg and uterine lining break down, and menstruation takes place.



Approximately once a month

Assess

Reviewing Key Concepts

- The joining of an egg and a sperm
 - The egg and sperm join together and the resulting fertilized egg contains all the information needed to grow into a new individual.
 - A sex cell has 23 chromosomes, while a zygote has 46. A zygote results from the joining of an egg and sperm during fertilization.
- Male—testes, scrotum, penis; female—ovaries, fallopian tubes, uterus, vagina
 - Testes—produce sperm and testosterone; scrotum—external pouch of skin that contains the testes and keeps them cooler than body temperature; penis—organ through which semen leaves the body; ovaries—produce eggs and hormones, such as estrogen; fallopian tubes—passageways eggs travel to the uterus; uterus—holds the fertilized egg; vagina—birth canal.
 - Similar—both produce sex cells and hormones; different—testes produce sperm and testosterone, while ovaries produce eggs and estrogen
- The monthly cycle of changes that occur in the female reproductive system
 - Days 14 to 15

Reteach L1

Have students name the structures and functions of the male and female reproductive systems using the diagrams in this section.

Performance Assessment L2

Skills Check Have students create flowcharts showing the path of sperm or egg through its respective reproductive system.

All in One Teaching Resources

- Section Summary: *The Male and Female Reproductive Systems*
- Review and Reinforce: *The Male and Female Reproductive Systems*
- Enrich: *The Male and Female Reproductive Systems*