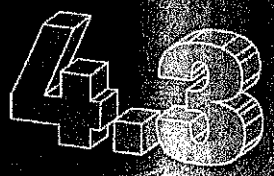


KEY CONCEPT

The reproductive system allows the production of offspring.

BEFORE, you learned

- Some hormones regulate sexual development
- Glands release hormones

NOW, you will learn

- About specialized cells and organs in male and female reproductive systems
- About fertilization
- About the development of the embryo and fetus during pregnancy

VOCABULARY

menstruation p. 119
fertilization p. 121
embryo p. 121
fetus p. 122

EXPLORE Reproduction

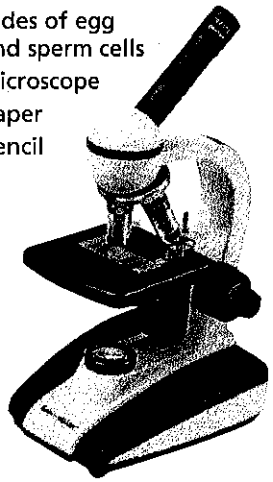
How are sperm and egg cells different?

PROCEDURE

1. From your teacher, gather slides of egg cells and sperm cells.
2. Put each slide under a microscope.
3. Draw a sketch of each cell.
4. With a partner, discuss the differences that you observed.

MATERIALS

- slides of egg and sperm cells
- microscope
- paper
- pencil



WHAT DO YOU THINK?

- What were the differences that you observed?
- What are the benefits of the different characteristics for each cell?

The reproductive system produces specialized cells.

CHOOSE YOUR OWN STRATEGY
Begin taking notes on the idea that the reproductive system produces specialized cells. You might use an outline or another strategy of your choice.

Like all living organisms, humans reproduce. The reproductive system allows adults to produce offspring. Although males and females have different reproductive systems, both systems share an important characteristic. They both make specialized cells. In any organism or any system, a specialized cell is a cell that takes on a special job.

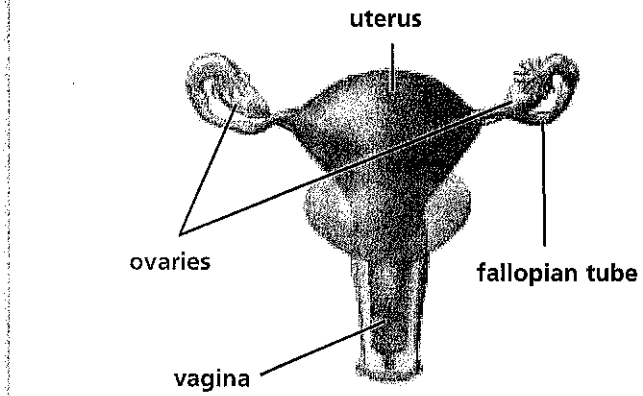
In the female these specialized cells are called egg cells. In the male they are called sperm cells. In the reproductive system, each specialized cell provides genetic material. Genetic material contains the information that an organism needs to form, develop, and grow.

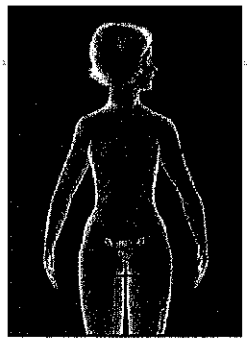
Both the male and female reproductive systems rely on hormones from the endocrine system. The hormones act as chemical messengers that signal the process of sexual development. Sexual development includes the growth of reproductive organs and the development of sexual characteristics. Once mature, the reproductive organs produce hormones to maintain secondary sexual characteristics.

The Female Reproductive System

The female reproductive system has two functions. The first is to produce egg cells, and the second is to protect and nourish the offspring until birth. The female has two reproductive organs called ovaries. Each ovary contains on average hundreds of egg cells. Every 28 days, the pituitary gland releases a hormone that stimulates some of the eggs to develop and grow.

Female Reproductive Organs





Menstruation

After an egg cell develops fully, another hormone signals the ovary to release the egg. The egg moves from the ovary into a fallopian tube. Within ten to twelve hours, the egg cell is fertilized by a sperm cell and moves to the uterus. Once inside the thick lining of the uterus, the fertilized egg cell rapidly grows and divides.

However, if fertilization does not occur within 24 hours after the egg cell leaves the ovary, both the egg and the lining of the uterus begin to break down. The muscles in the uterus contract in a process called **menstruation.** Menstruation is the flow of blood and tissue from the body through a canal called the vagina over a period of about five days.

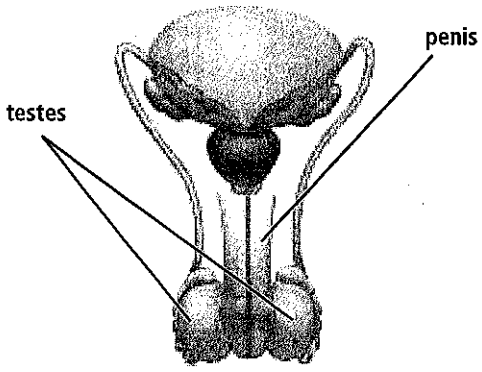
CHECK YOUR READING Where does the egg travel to after it leaves the ovary?

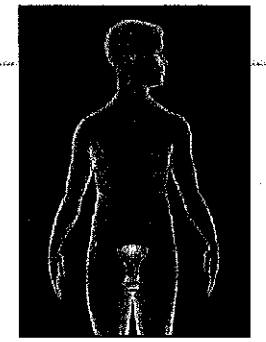
The Male Reproductive System

Testes The organs that produce sperm are called the testes (TEHS-teez). Inside the testes are tiny, coiled tubes hundreds of feet long. Sperm are produced inside these coiled tubes. The testes release a hormone that controls the development of sperm. This hormone is also responsible for the development of physical characteristics in men such as facial hair and a deep voice.

Sperm Sperm cells are the specialized cells of the male reproductive system. Males start producing sperm cells sometime during adolescence. The sperm is a single cell with a head and a tail. The sperm's head is filled with chromosomes, and the tail functions as a whip, making the sperm highly mobile. The sperm travel from the site of production, the testes, through several different structures of the reproductive system. While they travel, the sperm mix with fluids. This fluid is called semen and contains nutrients for the sperm cells. One drop of semen contains up to several million sperm cells.

Male Reproductive Organs





The reproduction of offspring includes fertilization, pregnancy, and birth.

VISUALIZATION
CLASSZONE.COM
Follow an egg from fertilization to implantation.

Each sperm cell, like each egg cell, has half of the genetic material needed for a human being to grow and develop. During sexual intercourse, millions of sperm cells leave the testes. The sperm cells exit the male's body through the urethra, a tube that leads out of the penis. The sperm cells enter the female's body through the vagina. Next they travel into the uterus and continue on to the fallopian tube.

Fertilization

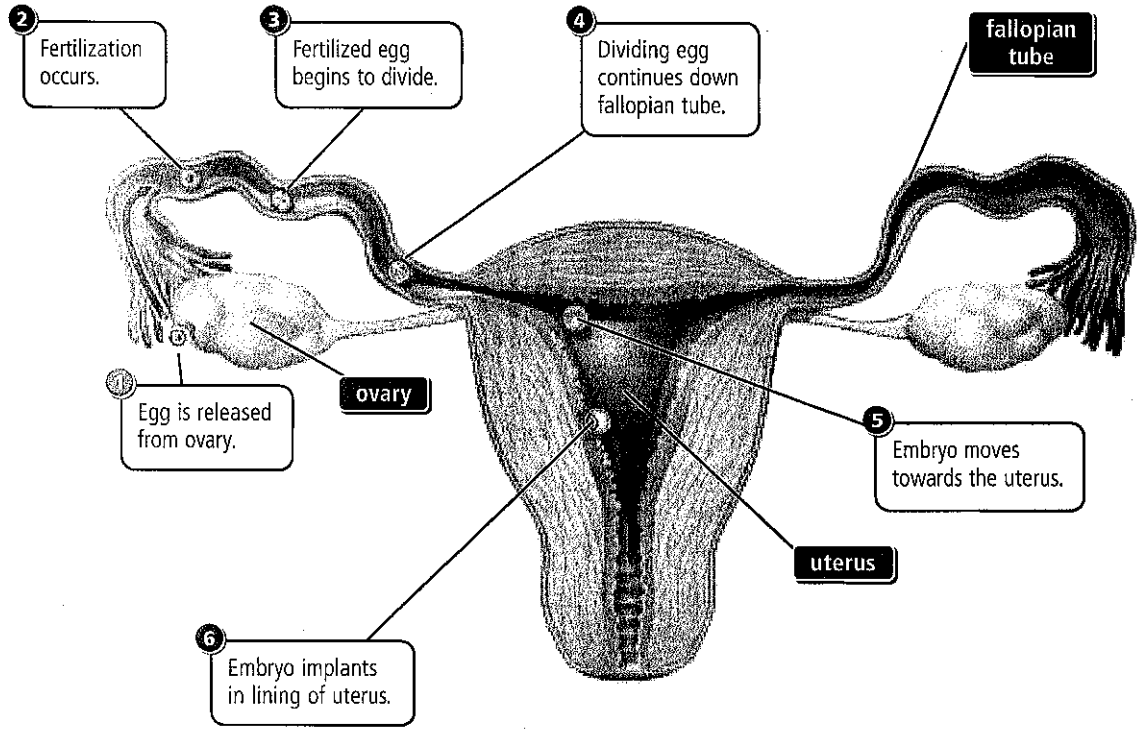
Fertilization occurs when one sperm cell joins the egg cell. The fallopian tube is the site of fertilization. Immediately, chemical changes in the egg's surface prevent any more sperm from entering. Once inside the egg, the genetic material from the sperm combines with the genetic material of the egg cell. Fertilization is complete.

The fertilized egg cell then moves down the fallopian tube toward the uterus. You can trace the path of the egg cell in the diagram on this page. It divides into two cells. Each of those cells divides again, to form a total of four cells. Cell division continues, and a ball of cells forms, called an **embryo.** Within a few days, the embryo attaches itself to the thickened, spongy lining of the uterus in a process called implantation.

VOCABULARY
Be sure to add the description wheels for the terms *fertilization* and *embryo* to your notebook.

Fertilization

The egg cell moves down the fallopian tube following fertilization. Its final destination is the uterus.



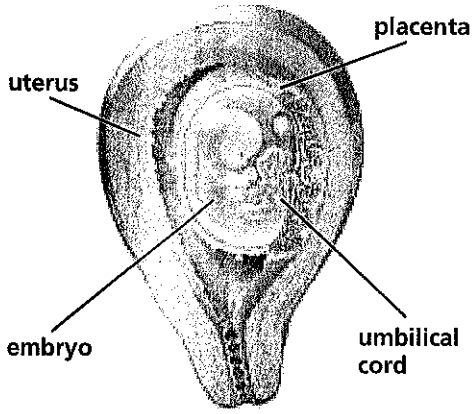
READING VISUALS Where does fertilization occur?

Pregnancy

The nine months of pregnancy can be divided into three periods of about the same length. Each period marks specific stages of development. In the first week following implantation, the embryo continues to grow rapidly. Both the embryo and the uterus contribute cells to a new, shared organ called the placenta. The placenta has blood vessels that lead from the mother's circulatory system to the embryo through a large tube called the umbilical cord. Oxygen and nutrients from the mother's body will move through the placenta and umbilical cord to the growing embryo.

Uterus and Placenta

By the fifth week of pregnancy, the placenta is fully developed.



Around the eighth week of pregnancy, the developing embryo is called a **fetus.** The fetus begins to have facial features, major organ systems, and the beginnings of a skeleton. The fetus develops the sexual traits that are either male or female. In the twelfth week, the fetus continues to grow and its bones develop further. In the last twelve weeks the fetus and all its organ systems develop fully.

CHECK YOUR READING Describe the development of an embryo and fetus at two weeks, eight weeks, and twelve weeks.

Labor and Delivery

At the end of pregnancy, the fetus is fully developed and is ready to be born. The birth of a fetus is divided into three stages; labor, delivery, and birth of the placenta.

The first stage of birth begins with muscular contractions of the uterus. These contractions occur at intervals of 10 to 30 minutes and last about 40 seconds. They happen continually until the muscular contractions are occurring about every 2 minutes.

The second stage of birth is delivery. With each contraction the cervix dilates until it becomes wide enough for the mother's muscles to push the fetus out. During delivery the fetus is pushed out of the uterus, through the vagina, and out of the body. The fetus is still connected to the mother by the umbilical cord.

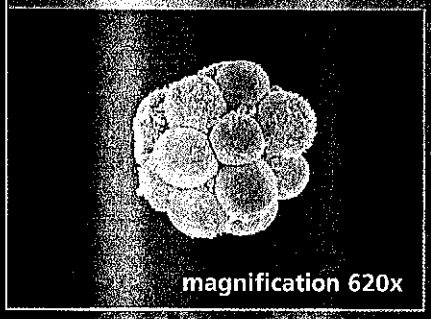
The umbilical cord is cut shortly after the fetus is delivered. Within minutes after birth, the placenta separates from the uterine wall and the mother pushes it out with more muscular contractions.

CHECK YOUR READING What happens during each of the three stages of birth?

Growth of the Fetus

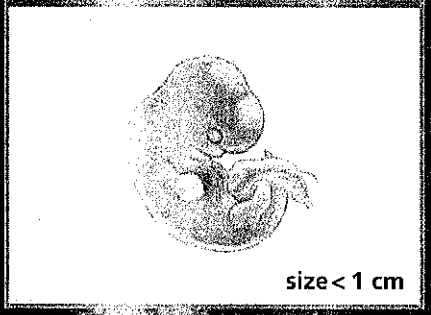
An embryo grows and develops from a ball of cells to a fully formed fetus.

4-day blastula



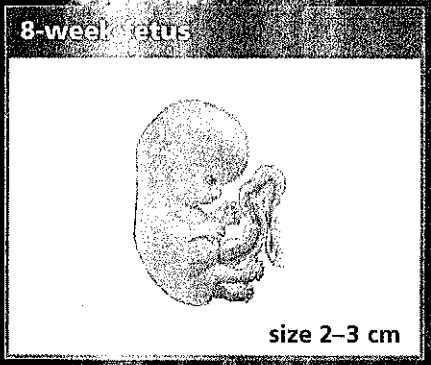
- Embryo has 16 cells
- Not yet implanted in the uterus

5-week embryo



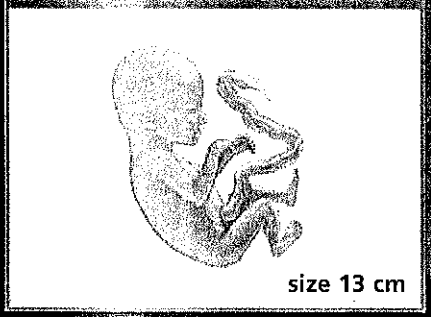
- Heart is beating
- Beginning of eyes, arms and legs are visible

8-week fetus



- Embryo is now called a fetus
- Has all basic organs and systems

16-week fetus



- Can move around in the womb
- Hair, eyelashes and eyebrows are growing

7–8 month fetus shown in this composite image is about 35–40 cm in length and weighs about 1.5–2.3 kg. The fetus usually gains at least 1 kg during the final month of pregnancy.

These twins provide an example of offspring born in a multiple birth.

Multiple Births

Do you have any friends who are twins or triplets? Perhaps you and your brothers or sisters are twins or triplets. The birth of more than one offspring is called a multiple birth. Multiple births are relatively uncommon in humans.

Identical twins are produced when a single fertilized egg divides in half. Each half then forms two complete organisms, or twins. Such twins are always of the same sex, look alike, and have identical blood types. Identical twins form early in pregnancy. Approximately 1 in 29 births is a set of identical twins.

Twins that are not identical are called fraternal twins. Fraternal twins are produced when two eggs are released at the same time and are fertilized by two different sperm. Consequently, fraternal twins may be very different from each other. Fraternal twins can be the same sex or different sexes.

CHECK YOUR READING Why are some twins identical and some are not?

4.3 Review

KEY CONCEPTS

1. Describe the function of the male reproductive system and the two main functions of the female reproductive system.
2. Explain how an egg travels from the ovary to the uterus.
3. How is an embryo different from a fetus?

CRITICAL THINKING

4. **Sequence** Describe the sequence of events that occurs between fertilization and the stage called implantation.
5. **Analyze** Detail two examples of hormones interacting with the reproductive system, one involving the male system and one involving the female system.

CHALLENGE

6. **Synthesize** Describe the interaction between the endocrine system and the reproductive system.