

Regulation and Reproduction

section 2 The Reproductive System

What You'll Learn

- the function of the reproductive system
- the major structures of the male and female reproductive systems
- the stages of the menstrual cycle

Before You Read

On the lines below, describe one way in which a male body differs from a female body.

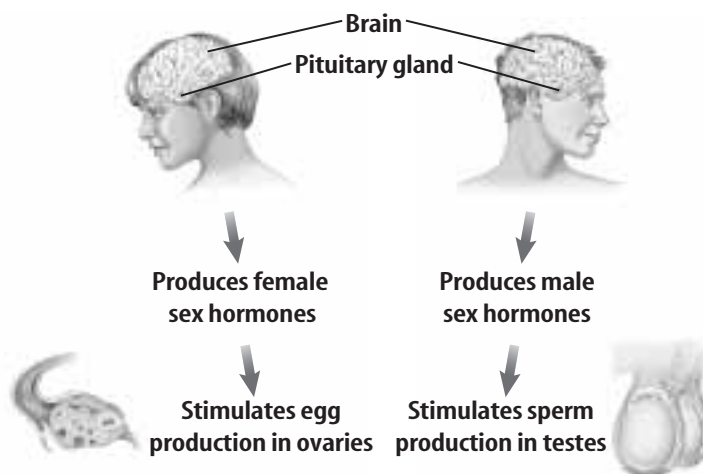
Study Coach

Create a Quiz As you study the information in this section, create questions about the information you read. The questions can be used to review the section's content.

Read to Learn

Reproduction and the Endocrine System

Most human body systems are the same in males and females, but the reproductive systems are different. As you can see in the figure below, the pituitary gland makes the sex hormones that control the male and female reproductive systems. Sex hormones are needed to develop sexual characteristics. Sex hormones from the pituitary gland begin the process of making eggs in females and sperm in males. Eggs and sperm pass hereditary information from one generation to the next.

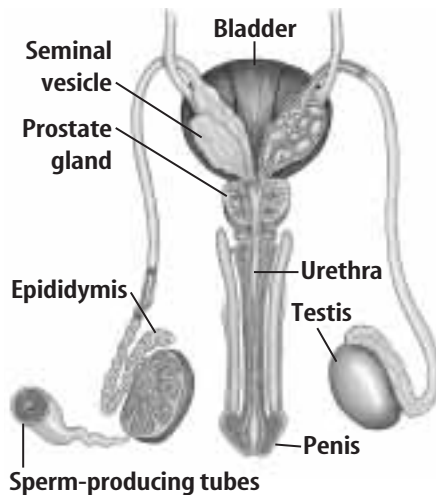


Picture This

- 1. Explain** Use the diagram to explain to a classmate what the pituitary gland does in females and then have the classmate explain what the pituitary gland does in males.

The Male Reproductive System

The male reproductive organs are inside and outside the body. As shown in the figure below, the organs outside the body are the penis and the scrotum (SKROH tum). The scrotum contains two organs called testes (TES teeZ) (singular, *testis*). The **testes** make the male hormone, testosterone (tes TAHS tuh rohn). They also make male reproductive cells, called **sperm**.



What happens to sperm?

Each sperm cell has a head and tail. The head contains hereditary information. The tail moves back and forth to push the sperm through fluid. Sperm travel out of the testes through sperm ducts that circle the bladder. The seminal vesicle (VEH sih cuhl) provides the sperm with a fluid. The fluid provides energy to the sperm and helps them move. The mixture of sperm and fluid is called **semen** (SEE mun). Semen leaves the body through the urethra. The urethra is the same tube that carries urine from the body.

The Female Reproductive System

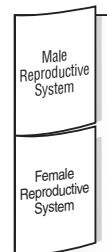
Most of the female reproductive organs are inside the body. The female sex organs are called the **ovaries**. The ovaries produce eggs. Eggs are the female reproductive cells.

Picture This

- 2. Identify** Underline the name of the structure that produces testosterone.

FOLDABLES™

- B Explain** Make a two-tab book Foldable, as shown below, to record notes about the structures and functions of the male and female reproductive systems.




Reading Check

3. **Identify** the structure the egg enters when it is released from the ovary.
-

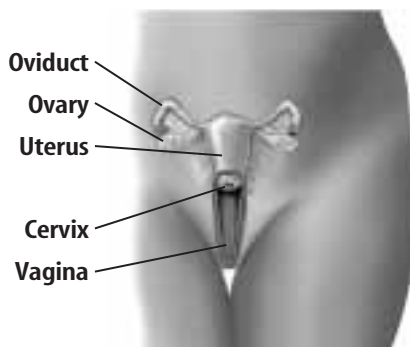
Picture This

4. **Explain** Trace the path of an egg after ovulation.

What happens to the eggs?

About once a month, hormones cause one of the ovaries to release an egg. The release of an egg from an ovary is called **ovulation** (ahv yuh LAY shun). After the egg is released, it enters the oviduct. Short, hairlike structures called cilia (SIH lee uh) help move the egg through the oviduct to the uterus (YEW tuh rus). The **uterus** is a muscular organ with thick walls. The fertilized egg develops in the uterus. 

As you can see in the figure below, at the lower hollow end of the uterus is the cervix. Connected to the cervix is a muscular tube called the **vagina** (vuh JI nuh). The vagina is also called the birth canal. When a baby is born, it travels through the vagina to the outside of the mother's body.



The Menstrual Cycle

The **menstrual** (MEN strul) **cycle** is the monthly cycle of changes in the female reproductive system. The menstrual cycle lasts about 28 days. During each cycle, an egg matures, female sex hormones are produced, the uterus prepares to receive a fertilized egg, and menstrual flow occurs. The first menstrual period happens between ages nine and 13 for most females.

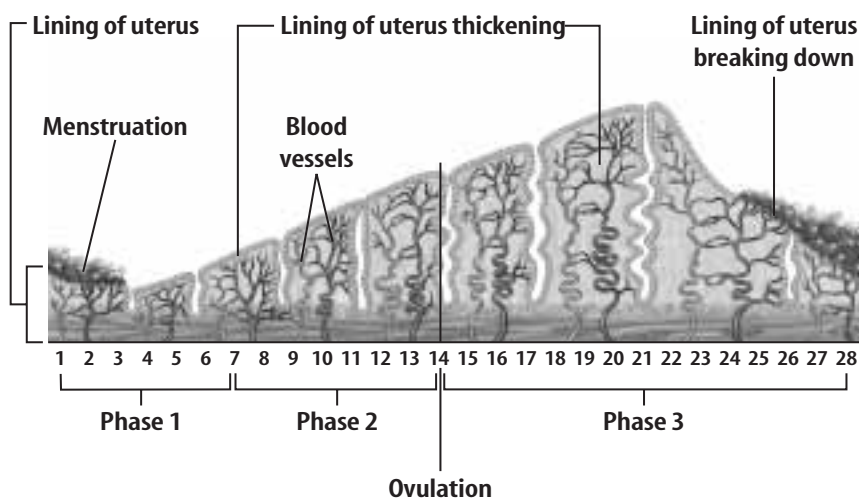
What controls the menstrual cycle?

The pituitary gland releases several hormones that control the menstrual cycle. These hormones begin the process that results in the release of the egg from the ovary. They also stimulate the production of two other hormones, estrogen (ES truh jun) and progesterone (proh JES tuh rohn). The interaction of all these hormones causes the menstrual cycle. The menstrual cycle has three parts, or phases.

Phase One of the Menstrual Cycle Phase 1 starts with the menstrual flow, called menstruation (men STRAY shun). This flow is made up of blood and tissue cells released from the thickened lining of the uterus. Menstruation lasts up to six days.

Phase Two of the Menstrual Cycle During phase 2 of the menstrual cycle, hormones cause the lining of the uterus to thicken. During phase 2, an egg develops in the ovary. The release of the egg, or ovulation, occurs about 14 days before menstruation begins. The egg must be fertilized within 24 hours or it begins to break down. Sperm can live in a female's body for up to three days, so fertilization can happen soon after ovulation. ✓

Phase Three of the Menstrual Cycle During phase 3, the lining of the uterus continues to thicken. If a fertilized egg arrives, the thickened lining of the uterus begins to support and feed the developing embryo. If the egg is not fertilized, the lining of the uterus breaks down and the menstrual cycle starts over. The changes to the uterus during the phases of the menstrual cycle are shown in the figure below.



✓ Reading Check

5. Explain For how long after ovulation can an egg be fertilized ?

Picture This

6. Identify During which phase is the lining of the uterus the thickest?

What is menopause?

For most females, the menstrual cycle ends between ages 45 and 60. Menopause occurs when the menstrual cycle ends. During menopause, the ovaries produce fewer and fewer sex hormones. The completion of menopause may take several years.

● After You Read

Mini Glossary

menstrual (MEN strul) cycle: the monthly cycle of changes in the female reproductive system

menstruation (men STRAY shun): phase 1 of the menstrual cycle, when blood and tissue cells are released from the thickened lining of the uterus

ovaries: the female sex organs that produce eggs

ovulation (ahv yuh LAY shun): the process that releases an egg from an ovary

semen (SEE mun): a mixture of sperm and fluid

sperm: male reproductive cells

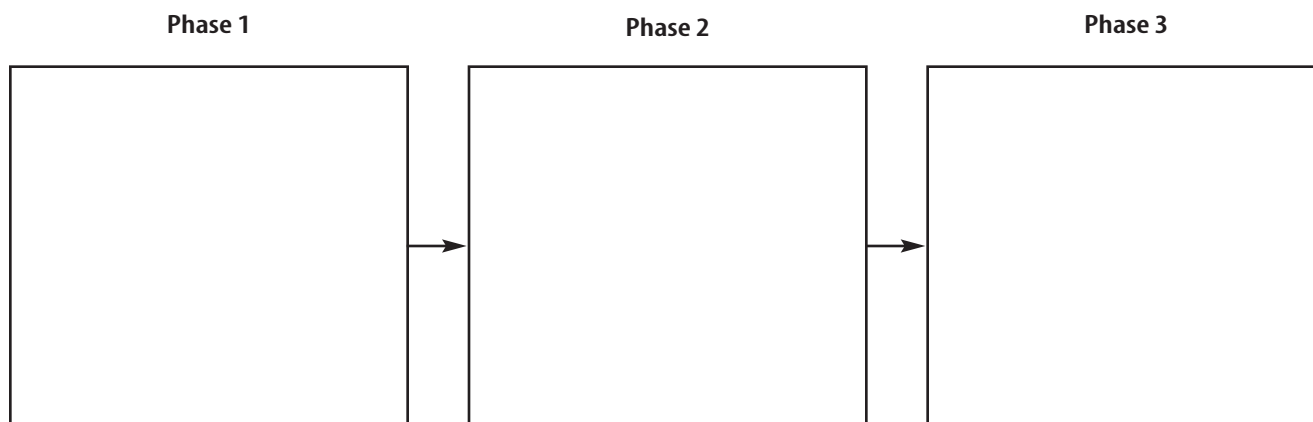
testes (TES teeZ): male reproductive organs that produce sperm and the male hormone, testosterone

uterus (YEW tuh rus): the female organ in which a fertilized egg develops

vagina (vuh JI nuh): part of the female reproductive system, a muscular tube connected to the cervix

1. Review the terms and their definitions in the Mini Glossary. Use at least two of the terms in a sentence to describe either the male or female reproductive system.

2. Complete the flow chart below by writing a phrase that describes what happens during each phase of the menstrual cycle.



3. How did writing and answering quiz questions help you better understand what you have read?



Visit life.msscience.com to access your textbook, interactive games, and projects to help you learn more about the reproductive system.

section 2 Human Life Stages

Before You Read

Describe the changes that you have seen happen in a young child over a year's time.

What You'll Learn

- how a human egg is fertilized
- how the embryo and fetus develop
- the life stages of infancy, childhood, adolescence, and adulthood

Read to Learn

Fertilization

A human develops from an egg that has been fertilized by a sperm. As sperm enter the vagina, they come in contact with chemicals given off in the vagina. These chemicals cause changes in the sperm that make it possible for the sperm to fertilize the egg. A sperm that touches the egg releases an enzyme. This enzyme helps the sperm enter the egg. Fertilization takes place when sperm and egg unite.

How does a zygote form?

Once a sperm enters an egg, the nucleus of the sperm joins with the nucleus of the egg. This joining creates a fertilized cell called the zygote (ZI goht).

Multiple Births

Mothers sometimes give birth to two or more babies at once. These are called multiple births. Multiple births can happen when an ovary releases more than one egg at a time or when a zygote divides into two or more zygotes.

Sometimes an ovary releases two eggs at the same time. If both eggs are fertilized, fraternal twins are born. Fraternal twins do not have the same hereditary information because they came from two different eggs. Fraternal twins can be the same or different sexes. ✓

Mark the Text

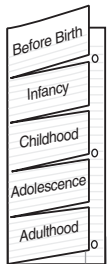
Locate Information As you read this section, highlight the portions of the text that describe the changes to an embryo and fetus during pregnancy.

Reading Check

1. **Explain** How many eggs must be fertilized for fraternal twins to be born?
-

FOLDABLES™

Describe Make a five-tab book Foldable on notebook paper, as shown below, to record notes about the changes that occur during each stage of human development.



Picture This

2. Explain Place the numbers 1, 2, or 3 beside the following words in the figure to show the order in which they happen: Fertilization, Implantation, and Ovulation.

Think it Over

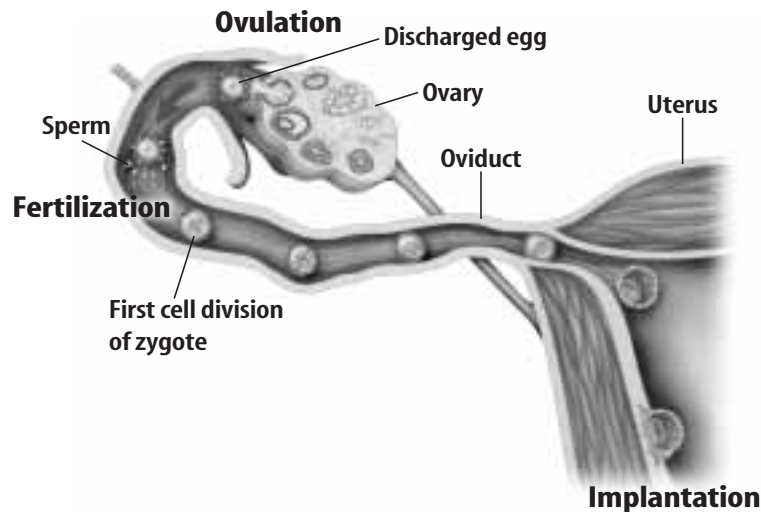
3. Conclude Why is the mother's good nutrition important to the embryo?

When are twins identical?

Identical twins develop from one egg that has been fertilized by one sperm. The zygote divides into two separate zygotes. Identical twins have the same hereditary information because they come from the same fertilized egg. Identical twins are always the same sex.

Development Before Birth

As you can see in the figure below, the zygote moves along the oviduct to the uterus. During this time, the zygote goes through many cell divisions. After about seven days, the zygote attaches to the wall of the uterus. This is called implantation. A zygote that attaches to the wall of the uterus will develop into a baby in about nine months. The period of development from fertilized egg to birth is called pregnancy.




When does a zygote become an embryo?

After the zygote attaches to the wall of the uterus, it is called an embryo (EM bree oh).

How does an embryo get food and oxygen?

After an embryo attaches to the uterus, a placenta (pluh SEN tuh) develops from tissues of the uterus and the embryo. An umbilical (um BIH lih kul) cord connects the embryo to the placenta. Blood vessels in the umbilical cord carry nutrients and oxygen from the mother's blood through the placenta to the embryo. Other blood vessels in the umbilical cord carry wastes from the embryo to the mother's blood.

What protects the embryo?

During the third week of pregnancy, a thin membrane called the **amniotic** (am nee AH tihk) **sac** forms around the embryo. The amniotic sac is filled with a clear fluid called amniotic fluid. The amniotic fluid acts as a cushion to protect the embryo. Amniotic fluid also stores nutrients and wastes. 


When does the embryo develop body parts?

During the first two months of development, the embryo's major organs form and the heart begins to beat. At five weeks, the embryo has a head with eyes, nose, and mouth. During the sixth and seventh weeks, fingers and toes develop.

How does a fetus develop?

Pregnancy in humans lasts about 38 to 39 weeks. After the first two months of pregnancy, the developing embryo is called a **fetus** (FEE tus). The fetus has all its body organs and is about 8 cm to 9 cm long. By the end of the seventh month of pregnancy, the fetus is 30 cm to 38 cm long. By the ninth month, the fetus is about 50 cm long. It weighs from 2.5 kg to 3.5 kg. During the ninth month, the fetus moves to a head-down position within the uterus. This is the best position for delivery.

The Birthing Process

The process of childbirth begins when the muscles of the uterus start to contract. This is called labor. As the contractions increase, the amniotic sac breaks and the fluid comes out. Over a period of hours, the contractions cause the opening of the uterus to get wider. More powerful and more frequent contractions push the baby out through the vagina into the world. After the baby is born, more contractions push the placenta out of the mother's body. 

When are babies delivered through surgery?

Sometimes babies cannot be born through the birth canal. In these cases, a baby is delivered through surgery called a cesarean (suh SEER ee uhn) section. In this surgery, a cut is made in the abdominal wall of the mother, then through the wall of the uterus. The baby is delivered through this opening.

Reading Check

4. **Explain** What are the functions of the amniotic fluid?

Reading Check

5. **Identify** two things contractions help push from the mother's body.

What happens after birth?

After birth, the baby is still attached to the umbilical cord. Two clamps are placed on the umbilical cord and it is cut between the clamps. The scar where the cord was attached is called the navel.

The experiences that a fetus goes through during childbirth can cause **fetal stress**. After it is born, the fetus must adapt from a dark, watery environment with a constant temperature to an environment with more light, less water, and changes in temperature. The first four weeks after birth are known as the neonatal (nee oh NAY tul) period. Neonatal means “newborn.” During this time the baby’s body begins to function normally.

Stages After Birth

After birth, four stages of development occur: infancy, childhood, adolescence, and adulthood. Infancy lasts from birth to around 18 months of age. Childhood lasts from the end of infancy to puberty (PYEW bur tee), the time of development when a person becomes physically able to reproduce. Adolescence is the teen years. Adulthood lasts from about the early 20s until death. ✓

How does a baby develop during infancy?

Human babies depend on other humans for their survival. During infancy a baby learns how to coordinate the movements of its body, as shown in the figure below. Its mental abilities increase, and it grows rapidly. Many infants triple their weight in the first year of life.

✓ Reading Check

6. **Explain** When do humans become physically able to reproduce?
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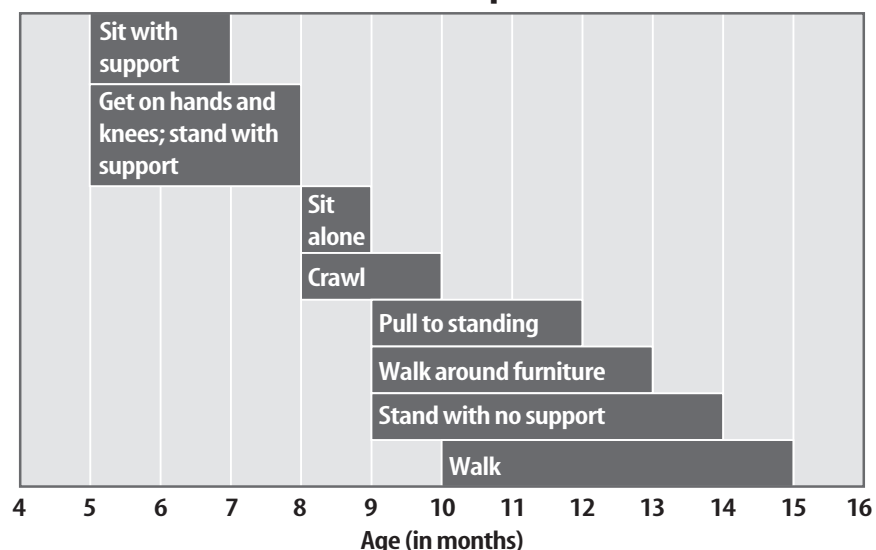
Picture This

7. **Identify** Study the table to answer the following questions.

a. At what age can most infants sit alone?

b. At what age do infants learn to walk?


Infant Development



What developments take place in childhood?


Childhood lasts from the age of about 18 months to about 12 years. Growth during childhood is rapid. Between two and three years of age, the child learns to control his or her bladder and bowels. Most children also can speak in simple sentences at age two or three. Around age four, the child can get dressed and undressed with some help. By age five, many children can read some words. Throughout childhood, children develop their abilities to speak, read, write, and reason.

What happens during adolescence?

Adolescence begins at about age 12 or 13 and ends at about age 20. Puberty is a part of adolescence. For girls, puberty happens between ages nine and 13. For boys, puberty occurs between ages 13 and 16. During puberty, hormones produced in the pituitary gland cause changes in the body. Females develop breasts, pubic and underarm hair, and fatty tissue around the thighs and buttocks. Males develop deeper voices, increased muscle size, and facial, pubic, and underarm hair. 

Adolescence is usually when a final growth spurt occurs. Most girls begin this final growth phase around age 11 and end around age 16. For boys, the final growth spurt begins around age 13 and ends around age 18. However, different people have different growth rates.

What happens during adulthood?

Adulthood begins when adolescence ends, at about age 20, and continues through old age. From about age 45 to age 60, middle-aged adults begin to lose physical strength. Circulatory and respiratory systems become less efficient. Bones break more easily, and skin wrinkles. 

What changes occur in older adults?

After age 60, adults may have an overall decline in their health. Their body systems do not work as well as they once did. Muscles and joints become less flexible. Bones become thinner and break more easily. Older adults may lose some of their ability to hear and see. Their lungs and heart do not work as well as they used to. Eating well and exercising throughout life can help delay these changes.

Reading Check

8. Identify When do most girls experience puberty?

Reading Check

9. Explain What physical changes occur during middle age?

● After You Read

Mini Glossary

amniotic (am nee AH tihk) sac: a thin membrane that forms around the embryo, acting as a cushion and a place to store nutrients and wastes

embryo (EHM bree oh): a fertilized egg or zygote after it attaches to the wall of the uterus

fetal stress: the experiences that a fetus goes through during childbirth

fetus (FEE tus): a developing human embryo after two months of pregnancy

pregnancy: the period of development from fertilized egg to birth

1. Review the terms and their definitions in the Mini Glossary. Write one or two sentences that explain the relationship of a zygote, an embryo, and a fetus.

2. Fill in the table below to identify and describe the stages of development after birth.

Stage of Development	Period of Time	Development Changes
	Birth to 18 months	
	18 months to 12 years	
	12 years to 20 years	
	20 years to 60 years	
	After age 60	

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