

CHAPTER 13

The Human Reproductive System

The BIG Idea

In humans, fertilization and embryo development take place inside a female's body.

LESSON 1 5.d, 7.a Reproductive Systems

Main Idea The structures of the human reproductive systems are specialized for the production of offspring.

LESSON 2 5.e, 7.a, 7.b, 7.c, 7.d

Development Before Birth

Main Idea The normal development of a fetus depends on the good health of its mother.



Sorry, but only one sperm per egg!

This scanning electron microscope image enlarges human sperm cells on a human egg cell thousands of times. You will read in this chapter that after one sperm cell enters an egg cell, other sperm cells cannot.

Science Journal Imagine that you are a sperm cell entering an egg cell. Describe your journey to the egg cell's nucleus.

Launch Lab

30-40
minutes

Is it a boy or a girl?

Each human's genetic makeup comes from his or her parents. Who determines a child's gender?

Procedure

1. Obtain a bag containing two **flat, wooden craft sticks** from your teacher. Open your bag and remove the sticks. You will have sticks labeled X and X (female) or X and Y (male). These are chromosomes.
2. Find someone with the opposite pair. This is your partner.
3. Put your sticks back in your own bag.
4. Each of you should draw a stick from your own bag. Record the letters and the gender of the offspring they represent.
5. Repeat steps 3 and 4 nine more times.
6. Calculate the number of male offspring and the number of female offspring.

Think About This

- **Infer** which parent determines gender.
- **Compare** the numbers of male offspring and female offspring for the entire class.



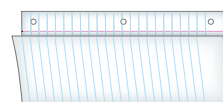
2.b, 7.c

FOLDABLES™ Study Organizer

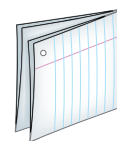
Reproductive Organs

Make the following Foldable to organize information about the organs of the male and female reproductive systems and functions.

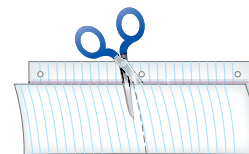
- ▶ **STEP 1 Fold** a sheet of paper in half lengthwise. Make the back edge about 2 cm longer than the front edge.



- ▶ **STEP 2 Fold** in half again.



- ▶ **STEP 3 Unfold** the paper once. **Cut** along the fold of the top flap to make two flaps. **Label** the flaps Male Reproduction and Female Reproduction.



Reading Skill

Monitoring Your Comprehension

As you read Lesson 1, list each reproductive organ and its function under the appropriate tab.

Science  online

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- ▶ view **Concepts in Motion**
- ▶ explore Virtual Labs
- ▶ access content-related Web links
- ▶ take the Standards Check

Get Ready to Read

Take Notes

1 Learn It! The best way for you to remember information is to write it down, or take notes. Good note-taking is useful for studying and research. When you are taking notes, it is helpful to

- phrase the information in your own words;
- restate ideas in short, memorable phrases;
- stay focused on main ideas and only the most important supporting details.

2 Practice It! Make note-taking easier by using a chart to help you organize information clearly. Write the main ideas in the left column. Then write at least three supporting details in the right column. Read the text from Lesson 1 of this chapter under the heading *Egg Production*, on page 508. Then take notes using a chart, such as the one below.

Main Idea	Supporting Details
	1. 2. 3.
	1. 2. 3.

3 Apply It! As you read this chapter, make a chart of the main ideas. Next to each main idea, list at least two supporting details.

Reading Tip

Read one or two paragraphs first and take notes after you read. You are likely to take down too much information if you take notes as you read.

Target Your Reading

Use this to focus on the main ideas as you read the chapter.

- 1 **Before you read** the chapter, respond to the statements below on your worksheet or on a numbered sheet of paper.
 - Write an **A** if you **agree** with the statement.
 - Write a **D** if you **disagree** with the statement.
- 2 **After you read** the chapter, look back to this page to see if you've changed your mind about any of the statements.
 - If any of your answers changed, explain why.
 - Change any false statements into true statements.
 - Use your revised statements as a study guide.

Before You Read A or D	Statement	After You Read A or D
	1 Every child is genetically related to one male and one female parent.	
	2 A female's reproductive system does not begin producing eggs until she reaches sexual maturity.	
	3 Both males and females begin to lose the ability to reproduce after age 54.	
	4 Millions of sperm fertilize one egg.	
	5 A developing fetus' heart does not begin to beat until after 24 weeks of development.	
	6 The umbilical cord and placenta supply the fetus with oxygen and nutrients from the mother's blood.	
	7 A mother's use of drugs or alcohol can lead to health problems for her child as the child grows and develops.	



Print a worksheet of this page at ca7.msscience.com.

LESSON 1

Science Content Standards

5.d Students know how the reproductive organs of the human female and male generate eggs and sperm and how sexual activity may lead to fertilization and pregnancy.

7.a Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.

Reading Guide

What You'll Learn

- ▶ **List** the organs of the male and female reproductive systems.
- ▶ **Compare and contrast** the development of sperm and eggs.
- ▶ **Sequence** the path traveled by sperm from formation to fertilization.
- ▶ **Describe** ovulation and the menstrual cycle.

Why It's Important

Knowing how human reproductive systems work will enable you to make well-informed decisions about your reproductive health.

Vocabulary

scrotum	uterus
seminiferous tubule	fallopian tube
epididymis	follicle
penis	ovulation
urethra	menstrual cycle
vagina	

Reproductive Systems

Main Idea The structures of the human reproductive systems are specialized for the production of offspring.

Real-World Reading Connection It's the first day of school. You notice that some students changed a lot over the summer but others hardly changed at all. Although you and your classmates are about the same ages, you are at different stages of physical development. Your reproductive systems are at different stages of development, too.

Male Reproductive System

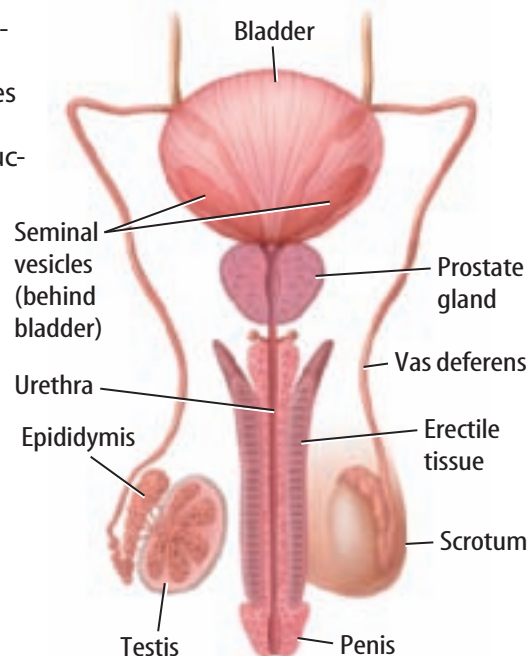
Adult males have many body characteristics that differ from adult females. Men usually have more body hair, deeper voices, and larger, more muscular bodies than women do. These features develop as boys get older and their reproductive systems grow toward maturity.

As you read in Chapter 3, testes (singular, testis) are male animal organs that produce sperm. Human males have two testes, as shown in **Figure 1**. A human male's testes do not begin to produce sperm until his reproductive system matures.



Which human male reproductive organ produces sperm?

Figure 1 The reproductive system of a human male produces and then delivers sperm to the reproductive system of a female.



Male Reproductive Organs

The testes are inside a baglike structure called the **scrotum**. It hangs outside the male's body cavity, which keeps the testes slightly cooler than the rest of the body. Normal human body temperature is too warm for sperm production. The cooler temperature in the scrotum enables sperm production.

Organs of Sperm Production The testes contain tightly coiled tubes called **seminiferous tubules** (se mih NIHF rus • TOOB yewlz), where sperm are produced. As shown in **Figure 2**, sperm travel from seminiferous tubules to a storage organ within the scrotum called the **epididymis** (eh puh DIH duh mus). It connects to muscular ducts or tubes called the vas deferens (VAS • DEF uh runz).

Organs of Sperm Transfer The male organ that transfers sperm to a female's reproductive tract is a **penis** (PEE nus). During sexual activity, sperm move from the vas deferens into a short ejaculation (ih ja kyuh LAY shun) duct that connects to a tube called the **urethra** (yoo REE thruh). The urethra extends to the end of the penis and carries sperm out of the body. The urethra also carries urine, but ejaculation and urination never occur at the same time.

When a male is sexually excited, the tissues of the penis fill with blood. This extra blood causes an erection, or firming of the penis. An erection is needed for the penis to enter a female's reproductive tract. During an ejaculation, sperm leave the epididymus, enter the vas deferens, move to the urethra, travel down the urethra, and out the end of the penis. It is important to know that sperm can leave the penis without the male's knowledge, either before ejaculation or during sexual activity that does not result in ejaculation.

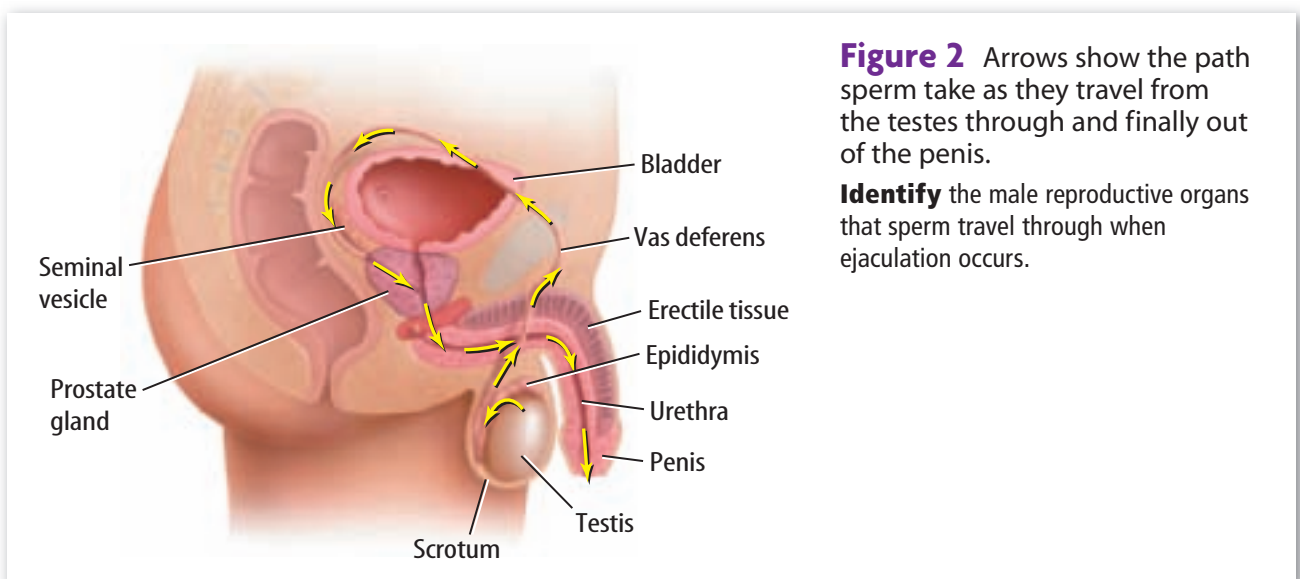
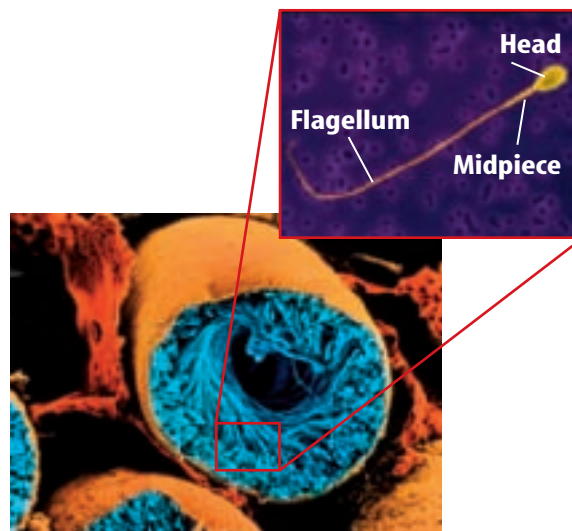
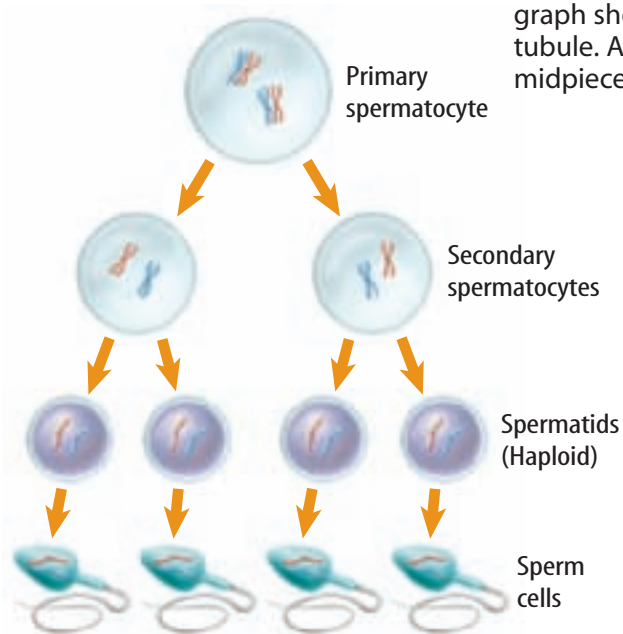


Figure 2 Arrows show the path sperm take as they travel from the testes through and finally out of the penis.

Identify the male reproductive organs that sperm travel through when ejaculation occurs.

Figure 3 Primary spermatocytes in the seminiferous tubules of the testes divide by meiosis to produce four haploid cells that will mature into sperm cells. This photograph shows sperm cells being produced in a seminiferous tubule. A mature sperm cell is made of three parts—head, midpiece, and a tail, or flagellum.



Sperm Production

Males start producing sperm during puberty (PYEW bur tee), which usually begins when they are 10–16 years of age. Sperm production occurs by meiosis in cells that line the seminiferous tubules, as shown in **Figure 3**. It takes 65–75 days to produce a mature sperm cell, also shown in **Figure 3**. A male can continue to make healthy sperm for the rest of his life.

Sperm and Semen

Each sperm consists of a head, a midpiece, and a tail. The head contains a nucleus, and the midpiece contains mitochondria that release energy. The tail, or flagellum, whips back and forth and propels the sperm forward.

A male ejaculates about 2–5 mL of semen (SEE mun) on average. Semen contains a liquid made by glands in a male's reproductive system and about 100 to 650 million sperm. The seminal vesicles are a pair of glands that makes most of the liquid in semen. They produce a thick, yellowish liquid that contains mucus, ascorbic acid (vitamin C), hormonelike substances that control cell activity, and an enzyme that helps thicken the semen. This liquid also contains sugar that is an energy supply for sperm. The prostate gland also makes some of the liquid in semen. It produces a thin, milky liquid containing enzymes and nutrients.



Which two glands make the liquid in semen?

Female Reproductive System

A female's reproductive system produces eggs. This system is also the place where a fertilized egg can grow and develop into a baby. Recall that a male begins producing sperm when he reaches puberty. A female begins producing eggs before she is born.

Female Reproductive Organs

Unlike a male, all the reproductive organs of a female are located inside her abdomen, as shown in **Figure 4**. Two folds of skin, called labia (LAY bee uh), protect the opening to a female's reproductive system. Beyond the opening, inside the female's body is a thin-walled chamber called the **vagina** (vuh JI nuh). This is where semen is deposited.

Uterus Above the vagina, further inside the body, is the **uterus** (YEW tuh rus). It is a thick, muscular organ inside which a fertilized egg can develop. A uterus is normally about the size and shape of a pear, but it enlarges during pregnancy. A tissue called the endometrium (en doh MEE tree um) lines the uterus. The neck, or opening, of the uterus into the vagina is called the cervix (SUR vihks). During childbirth, the cervix gets wider, or dilates. This enables the baby to move into the vagina and out of the mother's body.

Ovaries and Fallopian Tubes A pair of organs called ovaries (singular, ovary) produces eggs. An egg released from an ovary moves into a **fallopian tube** (fuh LOH pee un • TOOB) or oviduct that connects the ovary to the uterus, also shown in **Figure 4**. Fertilization usually occurs while the egg is in a fallopian tube. An egg cell has no flagellum, so it cannot move on its own like a sperm cell can. Recall from Chapter 1 that the surface of a cell can have hairlike structures called cilia that move back and forth. The cells on the inside surface of a fallopian tube have cilia. These cilia move an egg toward the uterus.

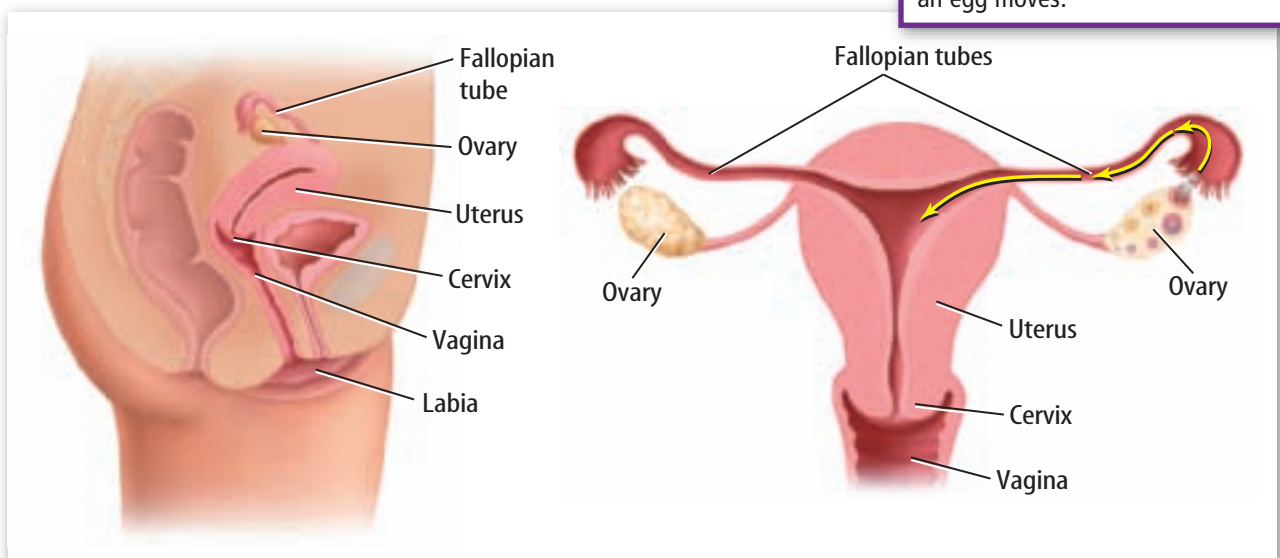
WORD ORIGIN

uterus

from Latin *uterus*; means
womb, belly

Figure 4 In the female reproductive system, eggs are produced by meiosis in ovaries. An egg travels from an ovary, into a fallopian tube, then toward the uterus.

Compare and contrast the way a sperm moves and the way an egg moves.



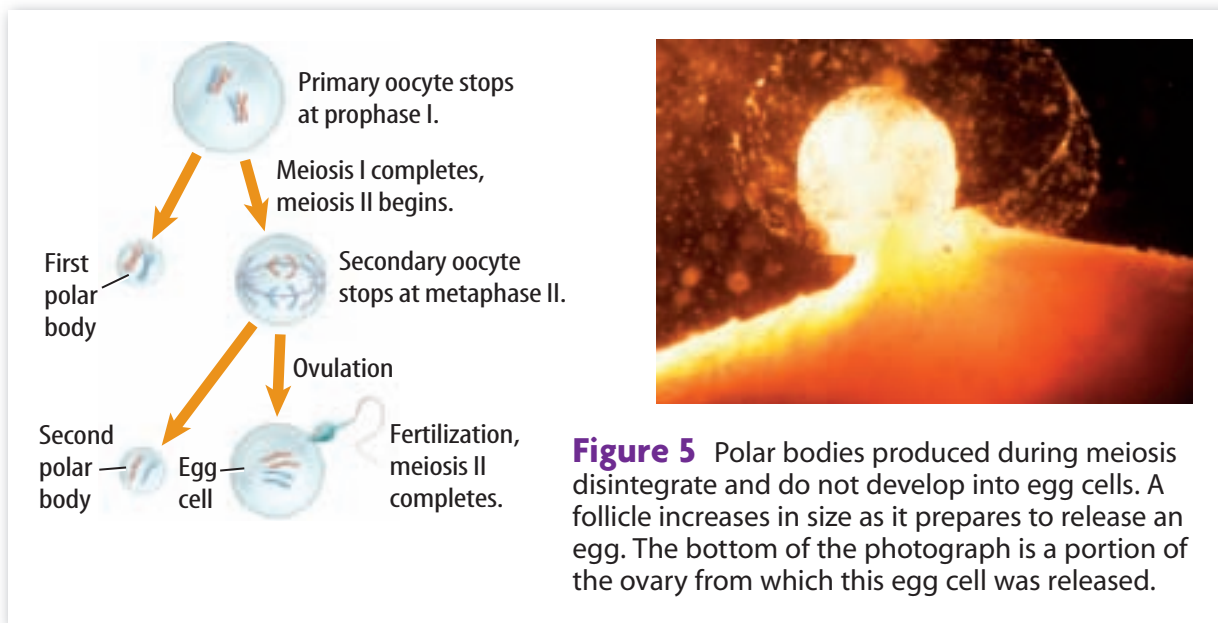


Figure 5 Polar bodies produced during meiosis disintegrate and do not develop into egg cells. A follicle increases in size as it prepares to release an egg. The bottom of the photograph is a portion of the ovary from which this egg cell was released.

Egg Production

Cell division by meiosis produces a human egg, as shown in **Figure 5**. Before a female is born, cells in her developing ovaries begin meiosis, but stop at the first phase, prophase I. The cells stopped at prophase I are called primary oocytes (OH uh sites). They remain unchanged until a female begins puberty.

Puberty in a human female usually begins between the ages of 9 and 13. At puberty, a female’s body begins producing chemical signals that cause primary oocytes to continue meiosis. However, meiosis stops again at the second stage of meiosis, metaphase II. The cells stopped at metaphase II are called secondary oocytes. Secondary oocytes are the egg cells. A female usually produces only one egg cell every four weeks on average. An egg cell does not complete meiosis until fertilization occurs.

Cells of the ovary surround, protect, and nourish each egg cell. A **follicle** (FAH lih kul) is an egg cell and its surrounding cells. A female at puberty has about 400,000 follicles. The release of an egg from a follicle into a fallopian tube is called **ovulation** (ahv yuh LAY shun), also shown in **Figure 5**.

Menstrual Cycle

Before a follicle releases an egg, other changes happen in a female’s body. The changes that take place before, during, and after ovulation are called the **menstrual** (MEN stroo ul) **cycle**. As illustrated in **Figure 6**, a menstrual cycle lasts about 28 days. The first day of a menstrual **cycle** is the first day of menstrual bleeding, or menstrual flow.



What event marks the start of a menstrual cycle?

WORD ORIGIN

follicle

from Latin *follicus*; means little bag

ACADEMIC VOCABULARY

cycle (SI kul)

(*noun*) a series of events that repeat

The cycle of the seasons includes spring, summer, autumn, and winter.

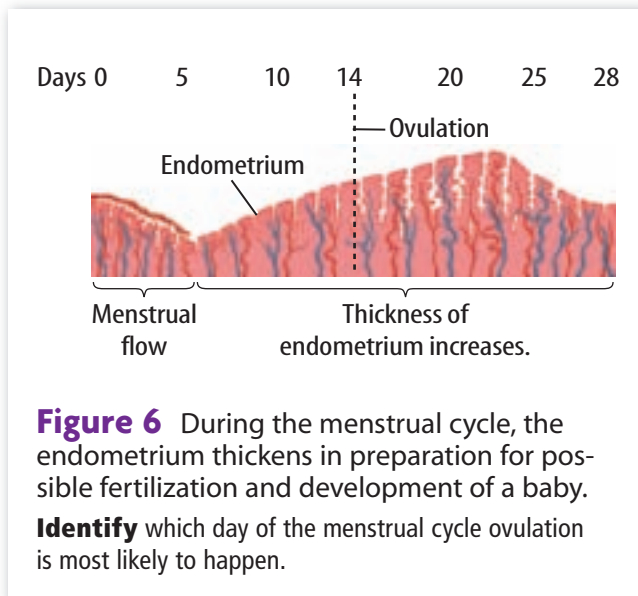


Figure 6 During the menstrual cycle, the endometrium thickens in preparation for possible fertilization and development of a baby. **Identify** which day of the menstrual cycle ovulation is most likely to happen.

Menstrual Flow During the menstrual cycle, the endometrium thickens and the number of blood vessels in it increases to support a fertilized egg. However, if a released egg is not fertilized, the endometrium breaks down and sloughs off. This tissue, some blood, and the unfertilized egg leave the vagina as menstrual flow. Menstrual flow usually lasts four to seven days. After menstrual flow stops, the endometrium thickens and its blood vessels regrow.

Ovulation About two weeks after the first day of menstrual flow, ovulation occurs. Usually, only one egg is released from one of a female’s ovaries during a menstrual cycle. It takes about 24 to 48 hours for an egg to move down the fallopian tube and into the uterus. If the egg is fertilized, a zygote forms, cell divisions begin, and an embryo begins to develop. When the embryo enters the uterus, it attaches to, or implants in, the endometrium. If this happens, menstrual bleeding does not occur. The absence of menstrual bleeding is usually one of the first signs of pregnancy.

Hormones Chemical messengers called hormones regulate the timing of the menstrual cycle and ovulation. Some of the glands and organs that produce hormones, including hormones that regulate menstrual cycles, are shown in **Figure 7** on the following pages.

Which hormones control ovulation?

The hormones LH and FSH help to control the menstrual cycle and ovulation.

Day of Cycle	Units of LH in Blood	Units of FSH in Blood
1	10	9
4	15	11
7	13	11
10	12	14
13	13	22
16	9	17
19	8	13
22	6	10
25	5	9
28	9	6

Source: Carlson, Bruce M. *Foundations of Embryology*. New York: McGraw-Hill. 1996.

Data Analysis

- Graph** the data. Use different colors to graph LH and FSH.
- Highlight** The day of highest hormone concentration is called the LH or FSH surge. Highlight each surge on your graph.
- Compare** your graph to **Figure 6**. **Relate** the amounts of LH and FSH to the day of ovulation.
- Infer** what might happen if a woman produced too little LH and FSH.

5.d, 7.a

MA7: AF 1.5, MR 2.5

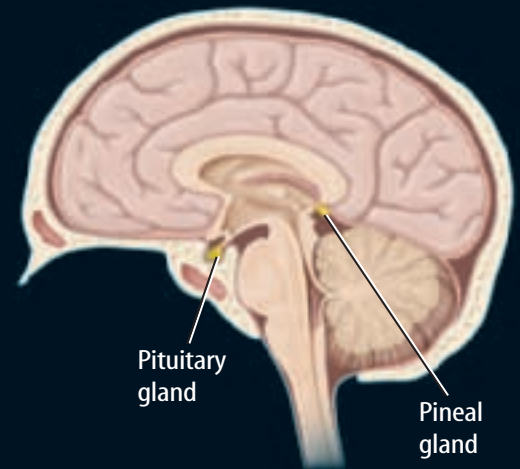


Visualizing Hormones

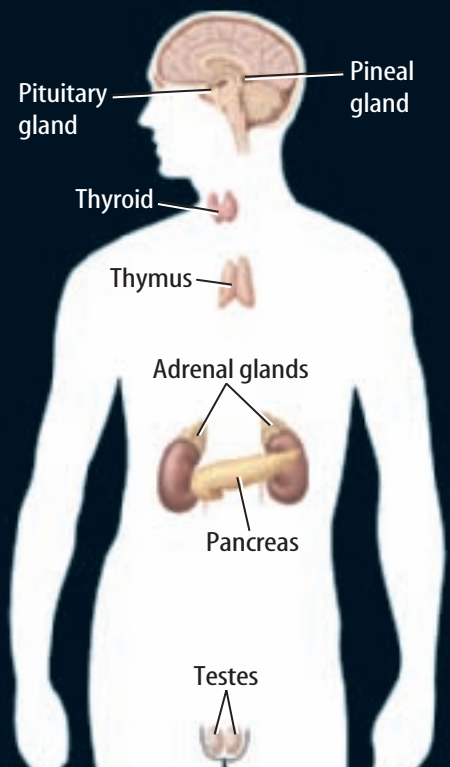
Figure 7

Your hormones regulate and coordinate many body functions, from reproduction to growth and development. They circulate in the blood and affect only specific cells. Glands and organs, including the nine shown here, produce hormones.

Melatonin (mel uh TOH nih) is a hormone that might function as a body clock that regulates sleep/wake patterns. The pineal (PIE nee uhl) gland that is deep within the brain produces melatonin. ▶



Hormones related to body activities, from reproduction to growth, are produced by the pituitary (pih TEW uh tee) gland. It is about the size of a pea and is attached to the hypothalamus (hi poh THAL uh mus) of the brain. ▶



◀ The thymus (THI mus)—a gland in the upper chest behind the sternum—produces hormones that stimulate the production of certain infection-fighting cells.

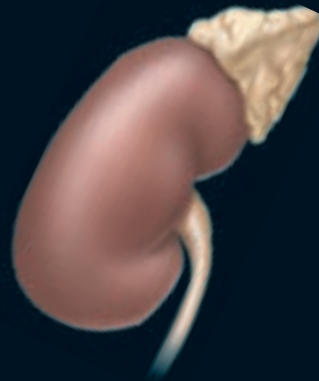
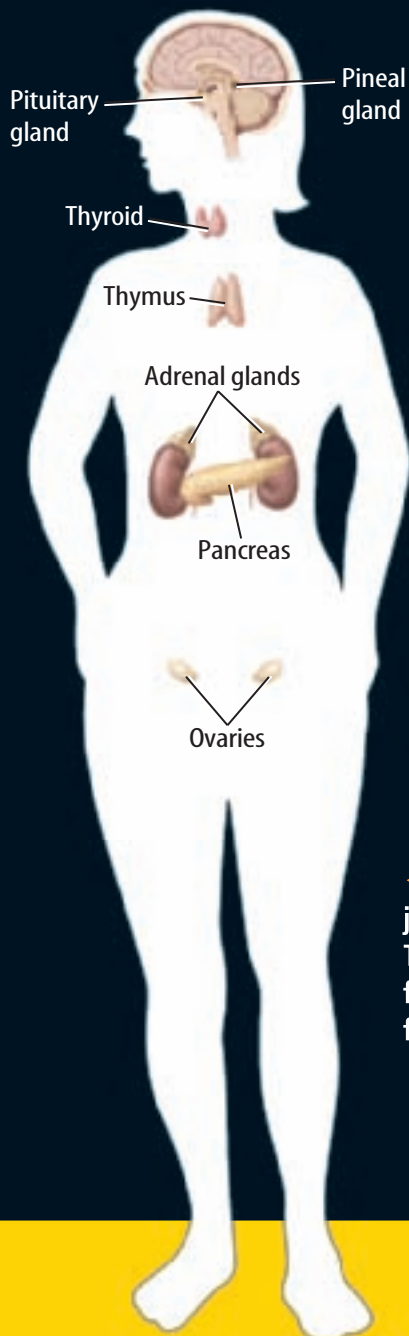
▶ Testosterone (tes TAHS tuh rohn) is a hormone that controls the development and maintenance of male sexual traits and plays an important role in the production of sperm. Testes produce testosterone.

Contributed by National Geographic



◀ The thyroid gland produces hormones that regulate metabolic rate, control the uptake of calcium by bones, and promote normal nervous system development. It is in the front of the neck below the larynx.

▶ PTH—a hormone that regulates calcium levels in the body and is essential for life—is produced by the parathyroid glands. They are four small glands attached to the back of the thyroid gland.



◀ The two adrenal glands produce a variety of hormones. Some play a critical role in helping your body adapt to physical and emotional stress. Others help stabilize blood sugar levels. An adrenal gland is on top of each kidney.

▶ Hormones that help control sugar levels in the blood are produced by the islets of Langerhans—tiny clusters of tissue scattered throughout the pancreas (PAN kree us).



◀ The ovaries produce estrogen (ES truh jun) and progesterone (proh JES tuh rohn). These hormones produce and maintain female sex characteristics and regulate the female reproductive cycle.

Menopause

Sometime between the ages of 46 and 54, most women stop ovulating and no longer have menstrual cycles. This stage of life is called menopause (MEN uh pawz). Many women begin to lose the ability to reproduce before menopause, as early as their mid-30s. As a woman gets older, the eggs she produces decrease in quality, and it becomes more difficult for her to have a successful pregnancy. An important difference between males and females is that a male's reproductive system continues to function throughout his lifetime, but a female's reproductive system does not.

Fertilization

Have you ever heard people say they were in the right place at the right time? The same might be said about sperm and fertilization. In humans, for a sperm to fuse with an egg cell, the sperm must swim to the right place—a fallopian tube—and at the right time—near the time of ovulation.

Sperm deposited in or near a female's vagina can swim into her reproductive tract, as shown in **Figure 8**. Most of these sperm will not make it to an egg. Some sperm swim into a fallopian tube that does not contain an egg. Some sperm swim in the opposite direction, away from the fallopian tubes. Other sperm might have genetic or physical defects that prevent them from fertilizing an egg even if they reach it. These facts help explain why millions of sperm are ejaculated to fertilize just one egg.

Normally, only one sperm fertilizes an egg, as shown in **Figure 8**. Once a sperm attaches to an egg, chemical reactions occur that block other sperm from entering the same egg. Sperm can live inside a female's reproductive tract for up to three days. Therefore, a female can become pregnant even if sexual intercourse occurs a couple days before she ovulates.

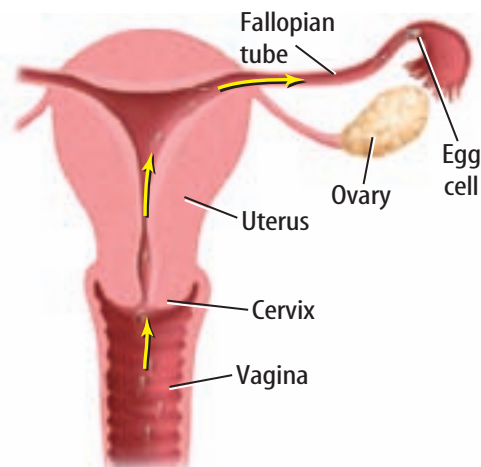
SCIENCE USE V. COMMON USE: fertilization

Science Use the joining of a sperm cell and an egg cell, forming a zygote. *Fertilization usually occurs in a woman's fallopian tubes.*

Common Use the application of a substance to soil to increase the soil's nutrients. *Fertilization of a garden's soil with aged animal manure can improve plant growth.*

Figure 8 From the vagina, a sperm must swim through the cervix, into the uterus, and then up a fallopian tube.

Identify the structure in which fertilization usually takes place.



Reproductive Systems Summary

In this lesson, you learned that the male reproductive system includes several organs, such as the testes where sperm are produced. Other male organs contribute fluid to the semen in which sperm move.

The female reproductive system also consists of several organs, including ovaries in which eggs develop. A menstrual cycle lasts about 28 days. It includes the building up of the endometrium, ovulation, and, if fertilization does not take place, menstrual flow. If an egg is fertilized and a zygote implants in the endometrium, the menstrual cycle stops and pregnancy begins.

LESSON 1 Review

Summarize

Create your own lesson summary as you organize an **outline**.

1. **Scan** the lesson. Find and list the first **red** main heading.
2. **Review** the text after the heading and list 2–3 details about the heading.
3. **Find** and list each **blue** subheading that follows the **red** main heading.
4. **List** 2–3 details, key terms, and definitions under each **blue** subheading.
5. **Review** additional **red** main headings and their supporting **blue** subheadings. List 2–3 details about each.



ELA7: W 2.5



Standards Check

Using Vocabulary

1. Distinguish between *vagina* and *uterus*. **5.d**
2. Write the definition of *menstrual cycle* in your own words. **5.d**

Understanding Main Ideas

3. Which is not part of the female reproductive system? **5.d**
 - A. epididymus
 - B. uterus
 - C. ovary
 - D. endometrium
4. **Compare** the roles of a male and a female in reproduction. **5.d**
5. **Describe** what happens to an egg from ovulation to implantation in the wall of the uterus. **5.d**
6. **Explain** why a male produces millions of sperm when usually only one egg is available to be fertilized? **5.d**

7. What structures move an egg through a fallopian tube? **5.d**
 - A. cilia
 - B. flagella
 - C. muscles
 - D. seminal vesicles
8. **Compare** sperm production and egg production. **5.d**

Applying Science

9. **Create** a table listing the male and female reproductive organs and their functions. **5.d**
10. **Sequence Information**
Draw a graphic organizer like the one below to create a time line about the menstrual cycle. **5.d**

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For more practice, visit **Standards Check** at ca7.msscience.com.

Applying Math

Hormone Levels and a Box-and-Whisker Plot

5.d

Hormone levels in humans vary within a standard range of normal. A group of ten women had LH levels measured in international units per liter (IU/L), as shown below, a few days following the end of their menstrual cycle.

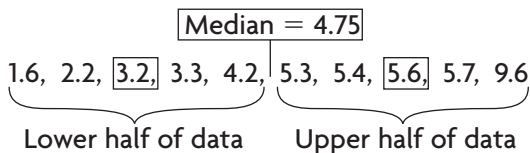
MA7: SDP 1.3

1.6, 3.3, 4.2, 3.2, 5.3, 9.6, 2.2, 5.4, 5.6, 5.7

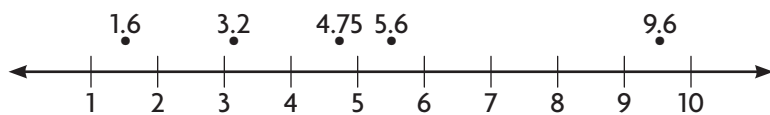
Example

Construct a box-and-whisker plot of this data set.

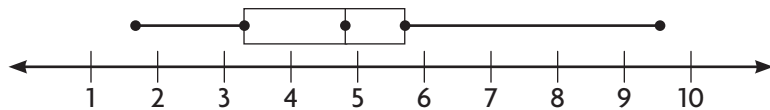
- 1 Order the data set from least to greatest value.
- 2 Find the median or the middle value of the data set. Since there is an even number of data values, the median is the average of the two middle values (4.2 and 5.3) or 4.75.
- 3 Find the middle value of the lower half of the ordered data—the lower quartile. The lower quartile is 3.2. Find the middle value of the upper half of the ordered data—the upper quartile. The upper quartile is 5.6.



- 4 Draw a number line. The scale should include the median, the quartiles, and the least (1.6) and greatest (9.6) data values. The last two values are called the lower extreme and the upper extreme. Graph these five values as points above the line.




- 5 Draw the box and whiskers. Each of the four parts of a box-and-whisker plot contains one fourth of the data.



Practice Problems

1. Is an LH hormone value of 3.8 closer to the lower quartile or the median?
2. What is the range of these data?

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LESSON 2



Science Content Standards

5.e Students know the function of the umbilicus and placenta during pregnancy.

Also covers: 7.a, 7.b, 7.c, 7.d

Reading Guide

What You'll Learn

- ▶ **Explain** the importance of the placenta and the umbilical cord to a fetus.
- ▶ **List** the major developmental stages of a fetus.
- ▶ **Infer** how a mother's lifestyle can affect her fetus.

Why It's Important

Knowing how a fetus develops helps you understand how important it is for a pregnant woman to take good care of her health.

Vocabulary

pregnancy placenta
trimester umbilical
fetus cord
prenatal care

Review Vocabulary

embryo: an animal in the early stages of development, before birth

Development Before Birth

Main Idea The normal development of a fetus depends on the good health of its mother.

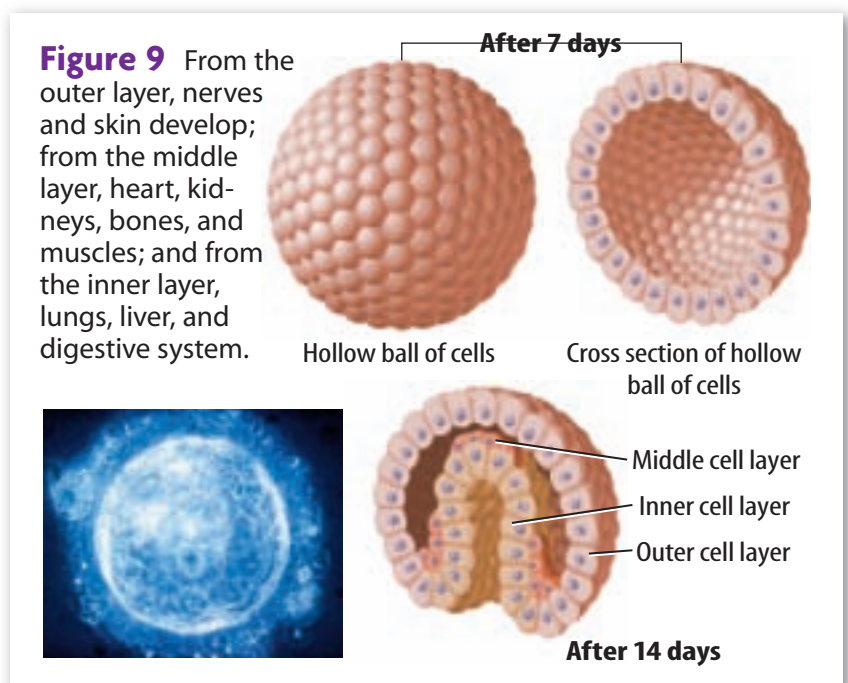
Real-World Reading Connection Did you know that someone might have taken your picture before you were born? A sonogram uses sound waves to produce a video image of a fetus. It can help a medical provider determine if the fetus is developing normally and whether it is a girl or a boy.

Fetal Development

Recall from Chapter 3 that all sexually produced organisms begin life as a zygote that forms when a sperm fertilizes an egg. Cell divisions of a human zygote begin about 24 hours after fertilization. Cells continue to divide and, after about seven days, a hollow ball of more than 100 cells has formed, as shown in **Figure 9**. This ball of cells is the embryo that implants into the endometrium. After two weeks of growth, the cells begin to arrange themselves into three layers, also shown in **Figure 9**. Different body structures eventually form from each layer. Over a period of about nine months, a human embryo develops into a baby.



When do cell divisions of a human zygote begin?



Growth and Development of Body Systems

The development of a baby within a female's uterus is called **pregnancy**. In humans, pregnancy usually lasts for 38 weeks after fertilization, or about 40 weeks after the beginning of the last menstrual cycle. When describing the many changes that take place during pregnancy, it is helpful to divide the nine months of pregnancy into three parts, called **trimesters**.

The first trimester is the first twelve weeks of pregnancy. By the end of the first trimester, an embryo has all the structures that will become the major organ systems of an adult. During the second and third trimesters, an embryo is called a **fetus** (FEE tus). A fetus changes as it continues to develop, as shown in **Table 1**. During the second trimester, the pregnant female can feel the fetus's movements. During the third trimester, the fetus grows rapidly, nearly tripling in size in preparation for birth.






Table 1 When might a fetus survive with intensive medical care?

Concepts in Motion

Interactive Table To explore more about the stages of pregnancy, visit Tables at ca7.msscience.com.

Table 1 Stages of Pregnancy

Stage	Example	Development
First trimester		By the end of the first trimester of pregnancy, an embryo has grown from a microscopic ball of cells to about 7.5 cm long, weighing about 23 g. Its heart is beating, and it can move its arms and legs.
Second trimester		At the end of the second trimester, a fetus is about 25–30 cm long and frequently makes kicking movements. The fetus shown here is about 24 weeks old. A baby born at this stage of development cannot survive without intensive medical care.
Third trimester		During the third trimester, a fetus usually triples in size. This fetus is 36 weeks old. A baby born at this stage of development probably would survive but might require medical care.

Premature Babies

Sometimes, infants are born prematurely, before development is complete. Premature babies can have difficulty surviving because some of their organs are not ready to function. The lungs are among the last organs to develop fully. Premature babies must often be cared for in the hospital until their lungs develop completely. Also, premature babies usually have low birth weights. Extremely premature and low birth weight infants can have physical challenges, learning difficulties, or behavioral problems as they grow older.

Placenta and Umbilical Cord

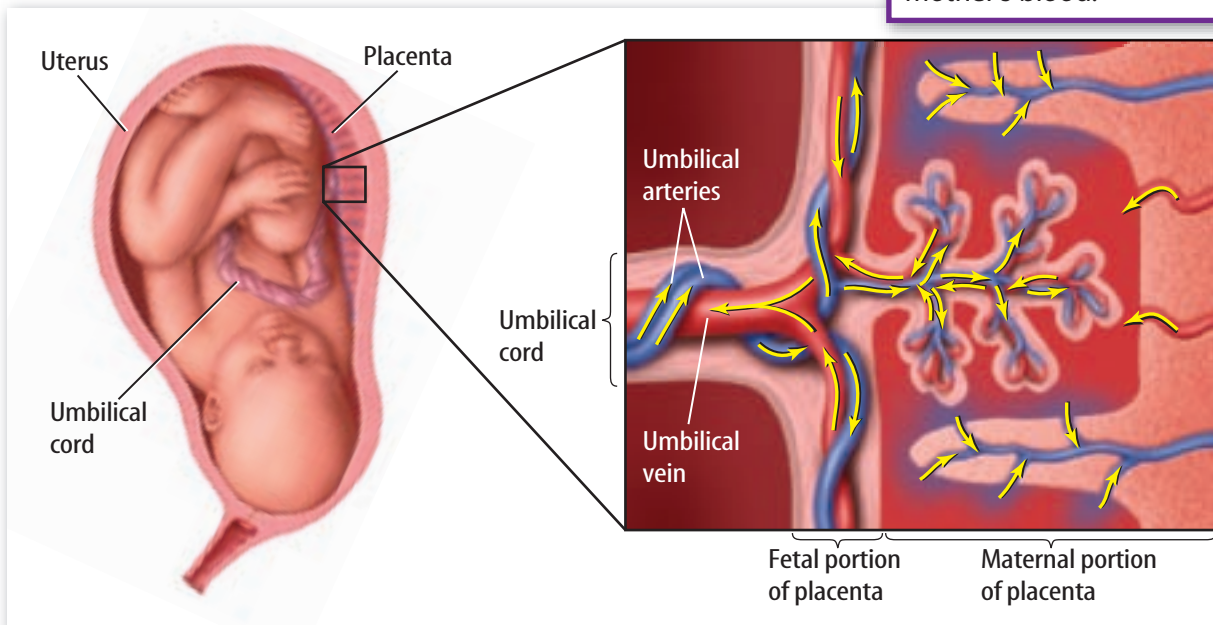
During development, a growing fetus receives oxygen and nutrients from its mother. A pregnant woman receives carbon dioxide and other wastes from her fetus. This exchange of materials between a pregnant woman and her fetus takes place through a disk-shaped organ called the **placenta** (pluh SEN tuh). A placenta begins to form when an embryo first implants into the endometrium. It develops from tissues of both the fetus and the endometrium. The placenta contains many blood vessels from both the fetus and its mother, but they are not directly connected.

Substances enter and leave the body of a fetus through an **umbilical** (un BIH lih kul) **cord**, as shown in **Figure 11**. The umbilical cord contains two arteries and one vein that connect the fetus to the placenta. When a baby is born, its umbilical cord is cut, but a few inches of it remain attached to the baby's body. This portion of the cord is called the umbilicus (um BIH lih kus). After a few days, the umbilicus dries up and drops off. The place where it was attached to the body is called a navel, or belly button.



What is the function of the umbilical cord?

Figure 10 Nutrients and oxygen move from the mother's blood into the placenta, through the umbilical cord, and then to the fetus. Wastes from the fetus move through the umbilical cord, to the placenta, and then into the mother's blood.



Fetal Health

Everything that happens in a woman's body has an effect on her developing fetus. Anything she does that could harm her health before or during her pregnancy could also harm her fetus. It is important for any woman who might become pregnant to take good care of her health. If she is in good health before she becomes pregnant, she has a better chance of having a healthy pregnancy and a healthy baby.

ACADEMIC VOCABULARY

supplement (SUH pluh muhnt)

(*noun*) something that adds to something else

Vitamin tablets and other types of food supplements contain the same vitamins and minerals found in grains, fruits, vegetables, and other foods.

Prenatal Care

Health care designed to protect the health of a pregnant woman and prevent problems in her developing fetus is called **prenatal care**. Research has shown that a pregnant woman who receives prenatal care from a certified health care provider has a better chance of delivering a healthy baby. A pregnant woman's prenatal care includes advice and information about nutrition, about viral infections, and about substances that could harm her fetus.



Why is prenatal care important?

Nutrition

All the energy and nutrients a fetus needs for normal development must come from its mother. Vitamins, minerals, proteins, fats, and carbohydrates pass from mother to fetus through the placenta. To support her growing fetus, a pregnant woman needs to eat a healthy diet that includes dairy products, proteins, fruits, vegetables, and whole grains, such as those shown in **Figure 11**.

Calories A pregnant woman is usually advised to add about 300 extra calories a day to her diet. The added calories supply the extra energy needed for the development of the fetus. However, it's best to choose healthy foods and avoid high-calorie foods that contain large amounts of sugar or fat, but few other nutrients.

Figure 11 A healthy diet for a pregnant woman includes foods such as those shown here.

Infer why it is important for a woman who might become pregnant to consume these types of food.



Folic Acid A fetus's spinal cord forms during the first weeks of pregnancy. Without a certain amount of folic acid, a form of vitamin B, spinal cord formation is abnormal. Doctors often recommend that pregnant women take vitamin **supplements** containing folic acid, in addition to eating a balanced diet.

Caffeine A pregnant woman should avoid caffeine, or consume it only in small amounts. Caffeine can increase a woman's blood pressure and heart rate, which can be stressful to her fetus.

Environmental Factors

A pregnant woman can encounter substances in her environment, such as those in **Figure 12**, that present health risks for her fetus. She might inhale harmful substances, consume them with food or water, or absorb them through her skin. These substances can then pass through the placenta and into the fetus. For example, a pregnant woman is usually advised to avoid using pesticides or insect repellents. Chemicals in insecticides and other pesticides can cause premature birth, birth defects, or miscarriage—the loss of an embryo during the first trimester.

Lead is a chemical element sometimes found in air pollution, old paint, and electronics. It can be harmful to anyone, but is especially harmful to a fetus, an infant, or a young child. Pregnant women who have been exposed to high levels of lead have a higher risk of miscarriage, premature delivery, and low birth-weight babies.

Figure 12 A pregnant woman is advised to avoid substances that could harm her fetus.



Can folic acid prevent birth defects?

Ten of every 10,000 babies in the United States are born with a neural tube birth defect, such as spina bifida. It occurs when the bones of the spine do not form properly during the first month of pregnancy. The data table below shows how folic acid affects a woman's risk of having a baby with a neural tube defect.

Effects of Folic Acid Supplements on Neural Tube Defects

Folic Acid Taken Before or During Pregnancy	Babies Born with Neural Tube Defects	Babies Born Without Neural Tube Defects
Yes	6	497
No	21	581

from CDC

Data Analysis

- Calculate** the percentage of babies with neural tube defects born to women who took folic acid.
- Calculate** the percentage of babies born with neural tube defects to women who did not take folic acid.
- Compare** the percentages of babies with neural tube defects for the two groups.
- Analyze** Does folic acid prevent neural tube defects? Explain why or why not.
- Conclude** What conclusion can be made from the data?

5.e, 7.a

MA7: NS 1.0, NS 1.3



Viruses

Viruses can pass from a pregnant woman to her fetus through the placenta or during childbirth. Nearly everyone has had an infection caused by a virus. You've probably had colds, flu, chicken pox, or measles. Other viral illnesses include genital herpes (HUR peeZ) and AIDS. Some viruses do not cause harm to adults, but they can be very harmful to a fetus or a newborn. For example, the viruses that cause chicken pox and genital herpes can cause birth defects or even death in newborns.



Give examples of viral diseases that can harm a fetus.

A virus that is deadly to both adults and newborns is the human immunodeficiency virus (HIV) that causes AIDS. AIDS attacks a person's immune system, limiting the infected person's ability to fight other infections. One out of every four pregnant women infected with HIV passes HIV to her fetus. An HIV-infected pregnant woman can lower the odds of having an HIV-infected baby if she sees a medical provider early, gets good medical care, and takes HIV-fighting medicines.

Drugs and Alcohol

A pregnant woman should always consult her medical provider before taking any over-the-counter medicine or prescription drug. A medicine that is safe for an adult might not be safe for a developing fetus.

Nicotine and Alcohol Nicotine, found in cigarettes, is a drug that has serious negative effects on a fetus. Smoking cigarettes during pregnancy can damage the placenta, and then it cannot deliver normal amounts of oxygen to a fetus. Also, the amount of nutrients passed to the fetus is reduced. A pregnant woman who smokes cigarettes runs a higher risk of having a premature baby. Even second-hand smoke can cause health problems for a fetus. A pregnant woman who drinks alcohol excessively risks having a baby with fetal alcohol syndrome (FAS), like the children shown in **Figure 13**.

Illegal Drugs A pregnant woman who uses alcohol or illegal drugs puts herself and her fetus in danger. Illegal drugs, including marijuana, cocaine, and heroin, enter the placenta and then pass into the body of the fetus. Use of these substances increases the chances for miscarriage, premature birth, and low birth weight. They also increase the chances that the child will have behavior problems and learning difficulties as it grows and develops.

Some drugs, such as cocaine and heroin, can cause the death of a fetus. A pregnant woman who shares needles to inject drugs increases her risk of being infected with viruses such as HIV.

Figure 13 Children born with fetal alcohol syndrome (FAS) have minor physical abnormalities but can have learning difficulties and behavioral problems as adults.



Development Before Birth Summary

In this lesson, you read that a human zygote develops into a hollow ball of cells that implants into the lining of the endometrium about one week after fertilization. Over the next several weeks, this embryo develops into a fetus that obtains oxygen and nutrients from the mother through the placenta and umbilical cord. A full-term pregnancy lasts about 38 weeks from fertilization.

A pregnant woman can help ensure that her baby has the healthiest possible start to life by getting good prenatal care, eating a nutritious diet, and avoiding exposure to drugs, alcohol, nicotine, and other harmful substances.

LESSON 2 Review

Summarize

Create your own lesson summary as you write a script for a **television news report**.

- Review** the text after the **red** main headings and write one sentence about each. These are the headlines of your broadcast.
- Review** the text and write 2–3 sentences about each **blue** subheading. These sentences should tell *who*, *what*, *when*, *where*, and *why* information about each **red** heading.
- Include** descriptive details in your report, such as names of reporters and local places and events.
- Present** your news report to other classmates alone or with a team.



ELA7: W 2.5



Standards Check

Using Vocabulary

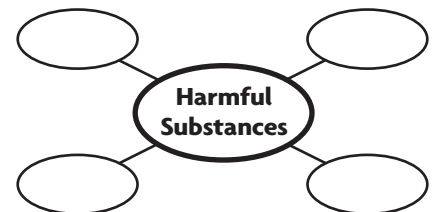
- Define prenatal care in your own words. **5.e**
- Use each term in a separate sentence: *pregnancy* and *fetus*. **5.e**

Understanding Main Ideas

- When is the developing embryo referred to as a fetus? **5.e**
 - by the end of week 2
 - by the end of week 4
 - by the end of week 12
 - by the end of week 24
- Explain** why it is important for a woman to take good care of her health during pregnancy. **5.e**
- Give an example** of a virus that could harm a developing fetus. **5.e**
- Distinguish** between the placenta and the umbilical cord. **5.e**

Applying Science

- Develop** a list of healthful foods a woman could add to her diet to increase her daily calorie intake during pregnancy. **5.e**
- Assess** the importance of seeing a healthcare professional during pregnancy. **5.e**
- Organize Information** Draw a graphic organizer similar to the one below to list substances that could be harmful to a developing fetus. **5.e**



Science  **online**

For more practice, visit **Standards Check** at ca7.msscience.com.



Use the Internet: A Healthy Pregnancy

Materials

computer with
internet access
library reference
materials



Science Content Standards

5.e Students know the function of the umbilicus and placenta during pregnancy.

7.a Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.

7.b Use a variety of print and electronic resources (including the World Wide Web) to collect information and evidence as part of a research project.

7.c Communicate the logical connection among hypotheses, science concepts, tests conducted, data collected, and conclusions drawn from the scientific evidence.

7.d Construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge (e.g., motion of Earth's plates and cell structure).

Problem

Fetal development takes place in a relatively short amount of time. In just nine months, a functioning human being develops from a zygote formed from the joining of an egg and a sperm. During that time, the fetus receives from its mother through the placenta and umbilical cord everything that it needs to grow and develop into a baby.

Form a Hypothesis

Develop an explanation for how a woman's lifestyle choices affect the substances that enter the fetus.

Collect Data and Make Observations

Research the fetal development of the organ or organ system your teacher has assigned to you. Use your textbooks, library resources, and ca7.msscience.com. Find the answers to these questions:

1. At what point during a pregnancy does this organ or system begin to develop, function, and become fully developed?
2. Are there specific substances that are harmful to this organ system's development? How do these substances reach the fetus?
3. What nutrients are required for the organ system's development?



4. Are there times during pregnancy when it would be safe for a pregnant woman to
 - drink alcohol?
 - smoke tobacco?
 - use illegal drugs?
 - be exposed to lead or other harmful environmental factors?
 - ignore advice about eating a healthy diet?
5. Do other organs or organ systems develop at the same time? Are they related to the function of your assigned organ or organ system?

Analyze and Conclude

1. **Sequence** the steps in the development of your assigned organ or organ system.
2. **Describe** hazards to the proper development of your assigned organ or organ system.
3. **Identify** the trimester of pregnancy during which the development of your assigned organ or organ system is particularly sensitive to the hazards listed in question 2.
4. **Explain** how a pregnant woman's lifestyle choices can support the development of your assigned organ or organ system. Are there vitamin supplements she can take? Are there foods or drinks she should avoid?
5. **Infer** from your data what substances are most harmful to the development of your assigned organ or organ system.
6. **Summarize** how your assigned organ or organ system interacts with other developing systems in the body of the fetus.

Communicate

WRITING in Science

Design a Visual Aid Using the information you have collected, design a visual aid to inform a pregnant woman about ways in which she can protect the health of her developing fetus. Present your information to your class and display the poster in your classroom.



Real World Science

Science & Career



The Science of Reproductive Endocrinology

Dr. Arlene Morales is a reproductive endocrinologist who practices in San Diego, California. A reproductive endocrinologist (en duh krih NAH luh jist) is a medical doctor who is a certified obstetrician/gynecologist with advanced training and education in reproductive endocrinology. Reproductive endocrinology is the science that deals with the interaction of the endocrine system and the reproductive system. This highly qualified physician treats infertility and disorders affecting the reproductive health of men, women, and children.

Visit **Careers** at ca7.msscience.com for more information about reproductive endocrinology. Write a list of interview questions you might ask Dr. Morales.

Ovarian Tissue Transplant

In June 2005, a healthy girl was born to a woman who had an ovarian tissue transplant—the first successful ovarian transplant in the United States. In April 2004, the 24-year-old mother received the ovarian tissue from her identical twin. Both women are shown in the photo to the right. The mother had not had a menstrual period since she was 13 years of age. Her sister had healthy ovaries as evidenced by her three children.

Visit **Technology** at ca7.msscience.com to research additional information about ovarian tissue transplantation. Write a summary paragraph about this procedure.



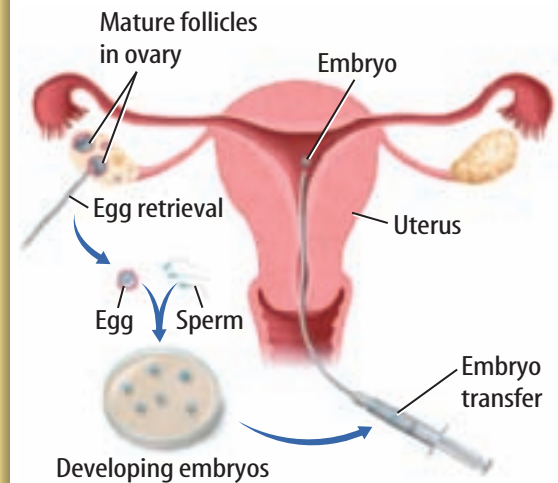
Science & Technology



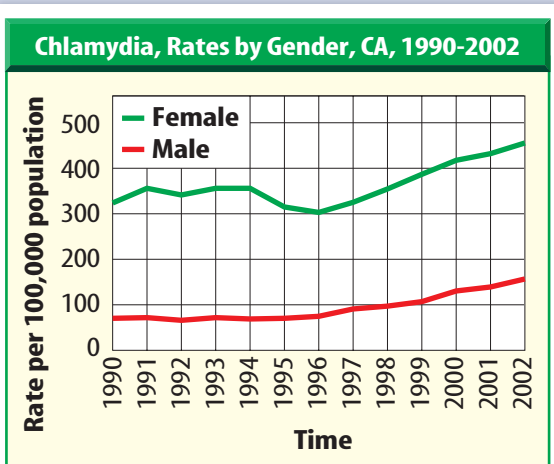
The First Test-Tube Baby

In 1978 in England, Louise Brown was the first baby born conceived by *in vitro* fertilization. The *in vitro* process involves extracting an egg/eggs from a female and sperm from a male. The sperm fertilize the egg/eggs and, two to five days later, are implanted into the woman's uterus. Since 1978, approximately 115,000 babies have been born in the United States that were conceived by *in vitro* fertilization.

Visit **History** at ca7.msscience.com for more information about this historic scientific breakthrough. Write a newspaper article announcing this event.



STDs—Sexually Transmitted Diseases



Source: California Department of Human Services, STD Control Branch

Despite prevention-education efforts and advances in diagnosis and treatment, sexually transmitted diseases remain a major concern for U.S. public health officials. The three most common STDs are chlamydia, gonorrhea, and syphilis. The Centers for Disease Control and Prevention estimates that almost 19 million new cases of STDs are reported annually among 15- to 19-year-olds. This number does not include highly infectious diseases, such as human papillomavirus and genital herpes.

Visit **Society** at ca7.msscience.com for more information about STD prevention. Choose one of the three common STDs and describe its cause, method(s) of transmission, symptoms, treatment, and prevention.

**The BIG Idea**

In humans, fertilization and embryo development take place inside a female's body.

Lesson 1 Reproductive Systems

5.d, 7.a

Main Idea The structures of the human reproductive systems are specialized for the production of offspring.

- Males produce sperm in their testes continuously throughout their lifetime.
- Female ovaries produce eggs.
- Egg production begins before a female is born.
- Females have a limited number of eggs and reproductive years.
- Sperm swim through a female's reproductive tract to reach an egg.
- Fertilization usually happens in a female's fallopian tubes.
- Only one sperm usually fertilizes an egg.
- Fertilization produces a zygote that develops into an embryo and implants into the uterus.

- epididymis (p. 505)
- fallopian tube (p. 507)
- follicle (p. 508)
- menstrual cycle (p. 508)
- ovulation (p. 508)
- penis (p. 505)
- scrotum (p. 505)
- seminiferous tubule (p. 505)
- urethra (p. 505)
- uterus (p. 507)
- vagina (p. 507)

Lesson 2 Development Before Birth

5.e, 7.a, 7.b, 7.c, 7.d

Main Idea The normal development of a fetus depends on the good health of its mother.

- Pregnancy usually lasts about 38 weeks.
- The organs and major structures of the fetus begin forming during the first trimester.
- A fetus is dependent on its mother for nutrition and waste removal.
- A mother's prenatal care and lifestyle choices affect the health of her fetus.

- fetus (p. 516)
- placenta (p. 517)
- pregnancy (p. 516)
- prenatal care (p. 518)
- trimester (p. 516)
- umbilical cord (p. 517)

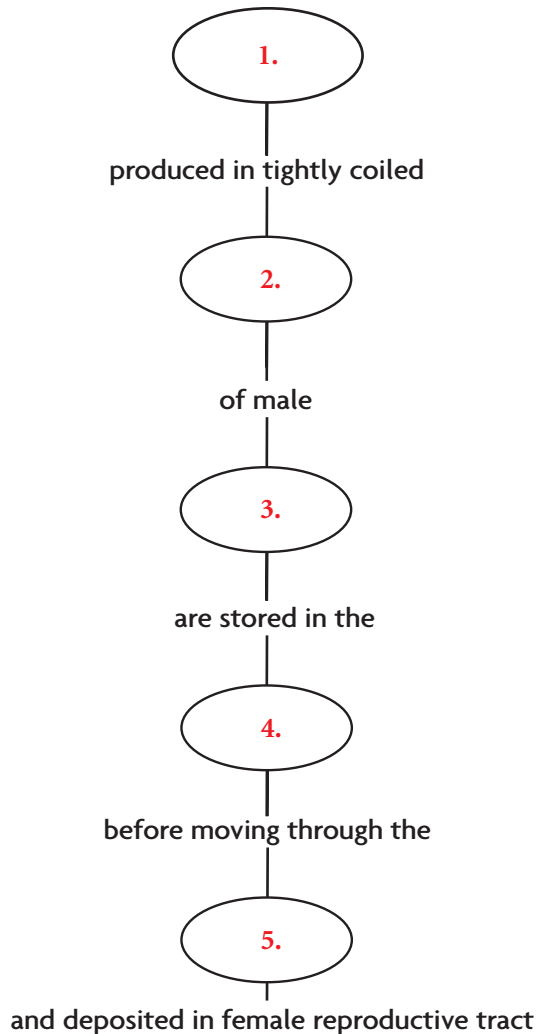



Download quizzes, key terms, and flash cards from ca7.msscience.com.



Linking Vocabulary and Main Ideas

Use vocabulary terms from page 526 to complete this concept map.



Science  **online**

Visit ca7.msscience.com for:

- ▶ Vocabulary PuzzleMaker
- ▶ Vocabulary eFlashcards
- ▶ Multilingual Glossary

Using Vocabulary

Fill in each blank with the correct vocabulary term.

Every 28 days, on average, one of a female's ovaries releases an egg in a process called 6.. Before the egg is released, it and the surrounding protective cells are called a(n) 7.. When released, the egg enters a(n) 8.. If sperm entered a female's 9. and swam into and through the 10. within a few days of egg release, the egg can be fertilized. This results in 11.. The fertilized egg grows and develops into a(n) 12. that is connected to its mother by a(n) 13.. The 14. exchanges materials between the mother and her baby.

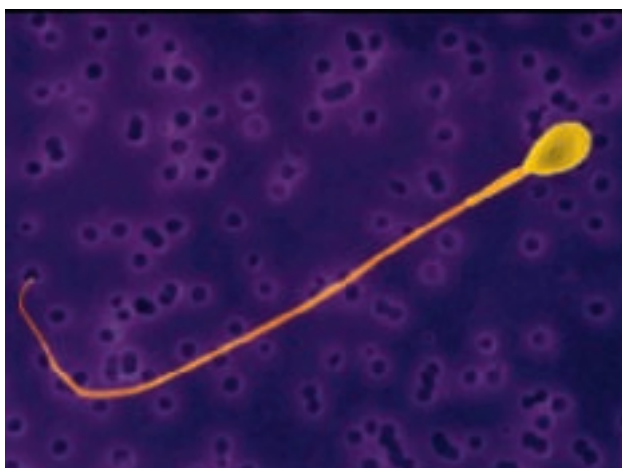




Understanding Main Ideas

Choose the word or phrase that best answers the question.

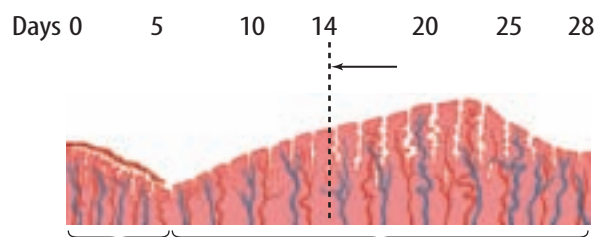
- What process is the release of an egg into the fallopian tube?
A. fertilization **5.d**
B. meiosis
C. ovulation
D. puberty
- What organ does a male use to deposit sperm in the female reproductive tract?
A. penis **5.d**
B. prostate
C. seminal vesicle
D. testis
- Where does a fetus grow and develop?
A. fallopian tube **5.d**
B. ovary
C. uterus
D. vagina
- Human reproductive organs have different functions.



What organ produces the structure shown above?

- ovary **5.d**
- penis
- testis
- urethra

- What female reproductive cells stopped at prophase I?
A. follicle **5.d**
B. oocytes
C. semen
D. uterus
- The thickness of a female's endometrium changes in response to other events.



What event is indicated by the arrow?

- implantation **5.d**
 - menopause
 - menstrual flow
 - ovulation
- Which does not happen in the placenta?
A. Fetus' blood and mother's blood mix. **5.d**
B. Medicines taken by the mother enter fetal blood.
C. Nutrients and water enter fetal blood.
D. Wastes from the fetus enter mother's blood.
 - What structure moves a sperm through a female reproductive system?
A. cilium **5.d**
B. flagellum
C. muscle tissue
D. seminal vesicle
 - What helps to regulate the timing of the menstrual cycle and ovulation?
A. semen **5.d**
B. endometrium
C. hormones
D. follicles



Applying Science

- 10. **Distinguish** between puberty and menopause. **5.d**
- 11. **Classify** these organs as male or female reproductive structures: ovaries, penis, scrotum, testes, vagina, uterus. **5.d**
- 12. **Create** a cycle map of the events that happen during one female menstrual cycle. **5.d**
- 13. **Explain** the importance of the three cell layers of an embryo, as shown in the diagram below. **5.e**



- 14. **Give an example** of a food item a mother should avoid eating in large amounts during pregnancy. **5.e**
- 15. **Diagram** how the blood supply of a fetus relates to the blood supply of the mother. **5.e**
- 16. **Develop** a list of warnings about environmental risk factors for pregnant woman. **5.e**
- 17. **Predict** what might happen if a sperm cell did not have mitochondria. **2.b**
- 18. **Suggest** a reason why the release of only one egg is a benefit to a mother and the fetus that could develop from that egg. **5.d**
- 19. **Hypothesize** why male cyclists who wear tight-fitting pants sometimes produce less sperm than normal. **5.d**
- 20. **Predict** what might happen if a pregnant woman does not include enough folic acid in her diet. **5.e**

WRITING in Science

- 21. **Write** a paragraph describing how oxygen and nutrients move from a mother's body to the body of a fetus, and how wastes move from the fetus to the mother's body. **ELA7: W 1.3**

Cumulative Review

- 22. **Give examples** of the classes of levers in the human body. **6.i**
- 23. **Describe** two ways that pressure is important in the body. **6.j**
- 24. **Construct** a diagram of the ear. Label each part and give its function. **5.g**

Applying Math

A group of ten men had the following levels of testosterone measured in nanomoles per liter (nmol/L). Use the data table below to answer questions 25–28.

Levels of Testosterone					
Participant Number	1	2	3	4	5
Testosterone (nmol/L)	30.4	21.8	16.5	9.1	12.4
Participant Number	6	7	8	9	10
Testosterone (nmol/L)	35.3	19.6	16.7	24.9	25.1

- 25. Order the data from smallest to largest. **MA7: SDP 1.3**
- 26. Find the median value of the data set. **MA7: SDP 1.3**
- 27. Find the lower quartile value of the data. **MA7: SDP 1.3**
- 28. Find the upper quartile value of the data. **MA7: SDP 1.3**





1 Which is NOT part of the menstrual cycle?

- A release of the follicle
- B maturing of egg
- C menopause ends
- D menstrual flow begins

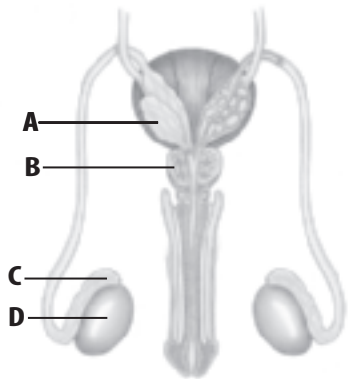
5.d

2 When do eggs start to develop in the ovaries?

- A before birth
- B at puberty
- C during childhood
- D during infancy

5.d

Use the illustration below to answer question 3.



3 Which structure produces most of the liquid in semen?

- A A
- B B
- C C
- D D

5.d

Preeclampsia is a condition that can develop in a woman after 20 weeks of pregnancy. It involves the development of hypertension or high blood pressure, an abnormal amount of protein in urine, and swelling. Use the table below to answer question 4.

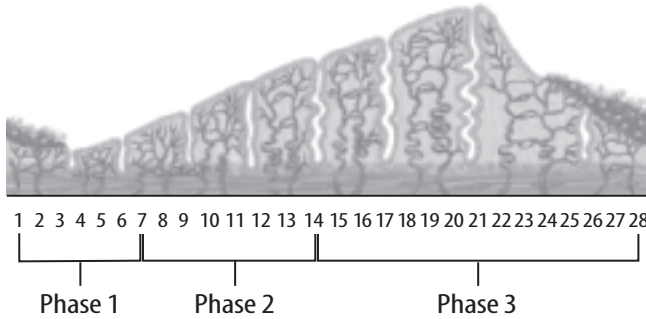
Preeclampsia Risk in Pregnancy	
Risk Factors	Risk Ratio
First pregnancy	3:1
Mother over 40 years of age	3:1
Family history of preeclampsia	5:1
Chronic hypertension	10:1
Chronic kidney disease	20:1
Diabetes mellitus	2:1
Twin birth	4:1

4 Which statement does not agree with the data in the table above?

- A A pregnant woman with chronic hypertension is at greater risk of developing preeclampsia than a pregnant woman with chronic kidney failure. 5.e
- B A pregnant woman having her first baby is at greater risk of developing preeclampsia than a pregnant woman with diabetes mellitus failure.
- C A pregnant woman over 40 years of age is at greater risk of developing preeclampsia than a pregnant woman with family history of preeclampsia.
- D A pregnant woman with diabetes mellitus is at greater risk of developing preeclampsia than a pregnant woman with twins.



Use the illustration below to answer questions 5 and 6.



5 What percentage of the menstrual cycle is phase 3?

- A 10
- B 25
- C 35
- D 50

5.d

6 What percentage of the menstrual cycle is phase 2?

- A 10
- B 25
- C 35
- D 50

5.d

7 What is the mixture of sperm and fluid called?

- A semen
- B testes
- C seminal vesicle
- D epididymis

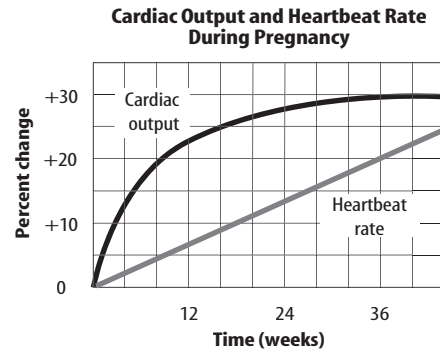
5.d

8 If a pregnant woman becomes infected with rubella, a viral disease also known as German measles, the virus can adversely affect the formation of the baby's major organs, such as the heart. When would a rubella infection in a pregnant woman most affect a fetus?

- A week 8
- B week 20
- C week 32
- D week 37

5.e

Use the graph below to answer questions 9 and 10.



9 Cardiac output increases during pregnancy to keep the fetus supplied with nutrients through the placenta. During which week of pregnancy does cardiac output reach its highest level?

- A 6
- B 20
- C 24
- D 36

5.e

10 What is the cardiac output of the mother at week 12?

- A 18
- B 22
- C 28
- D 30

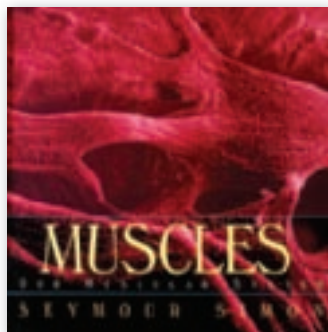
5.e

Reading on Your Own...



From the Recommended Literature for Science and Math

Are you interested in learning more about the structure and function of living systems and the physical principles associated with them? If so, check out these great books.



Nonfiction

Muscles: Our Muscular System, by Seymour Simon, describes the nature and work of muscles, the different kinds of muscles in the human body, and the effects of exercise and other activities upon the body system. This book contains full-color photographs. *The content of this book is related to Science Standard 7.5.*

Nonfiction

Bones: Our Skeletal System, by Seymour Simon, includes photographs, drawings, and X rays to provide basic information about the human skeleton. This book emphasizes the importance of bones in the healthy functioning of the human body. *The content of this book is related to Science Standard 7.5.*

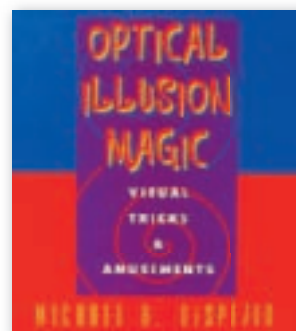


Nonfiction

It's so Amazing! A Book About Eggs, Sperm, Birth, Babies, and Families, by Robie Harris, answers questions with clear, factual information. This book features an enthusiastic bird and a reluctant bee who narrate the comic cartoon panels and add humor. *The content of this book is related to Science Standard 7.5.*

Nonfiction

Optical Illusion Magic: Visual Tricks & Amusements, by Michael DiSpezio, explains how we process optical illusions. This book contains illustrations of the human eye and describes how the eye relays information to the brain. *The content of this book is related to Science Standard 7.6.*



Choose the word or phrase that best answers the question.

- Which is a function of blood?
 - A. carries saliva to the mouth
 - B. excretes urine from the body
 - C. transports nutrients and oxygen to body cells
 - D. collects tissue fluid from around cells **5.b**
- Which is the site of sperm production?
 - A. endometrium
 - B. placenta
 - C. prostate gland
 - D. seminiferous tubules **5.d**
- Which is the most important difference between striated and smooth muscle?
 - A. Their cells contain different materials.
 - B. Their cells have different shapes.
 - C. They have different sizes of cells.
 - D. They have different functions. **5.a**
- The image below shows one organ in the human body.



To which body system does the organ labeled A belong?

- A. circulatory
 - B. digestive
 - C. respiratory
 - D. urinary **5.b**
- Why does the lens in the eye change shape?
 - A. to control the amount of light entering the eye
 - B. to form sharp images in dim light
 - C. to form sharp images of distant and nearby objects
 - D. to enable colors to be seen **6.b**

Write your responses to the following on a sheet of paper.

- Identify** what must happen for a light ray to be refracted as it passes from one medium into another. **6.f**
- Compare** the functions of ovaries and testes. **5.d**
- Explain** why blood sometimes is called “the tissue of life.” **5.b**
- Describe** the changes that occur in muscles that do a lot of work. Compare these muscles to the muscles of a person who is inactive most of the time. **5.c**
- Identify** the name of the center point about which a lever rotates. **6.h**
- Draw** a human ear and label the parts. **5.g**
- Explain** how the external ears aid hearing. How is this different in humans and other mammals? **5.g**
- Diagram** how the human body systems are connected to each other. **5.b**
- Design** and complete a comparison chart similar to the one shown comparing the male and female reproductive systems. **5.d**

Male	Both	Female