

# Prenatal Development and Birth

- Lesson 1** The Beginning of the Life Cycle
- Lesson 2** Prenatal Care
- Lesson 3** Heredity and Genetics
- Lesson 4** Infancy and Childhood



## Reading Programs for Children

Reading has many benefits for children. Being read to and learning to read helps children by

- ▶ fostering the desire to read.
- ▶ teaching cooperation.
- ▶ developing listening skills.

Visit the Eye on the Media section at [health.glencoe.com](http://health.glencoe.com) to learn more about the importance of reading programs for children.

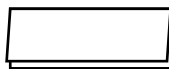
### FOLDABLES™ Study Organizer

#### Before You Read

Make this Foldable to help you organize information on the beginning of life. Begin with a sheet of plain 8½" x 11" paper.

#### ▶ Step 1

Fold a sheet of paper along the long axis, leaving a ½" tab along the bottom.



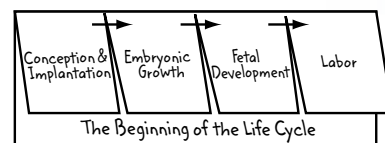
#### ▶ Step 2

Fold in half, then fold again into fourths.



#### ▶ Step 3

Unfold and cut along the three fold lines on the front flap. Label as shown.



#### As You Read

As you read and discuss the material in the chapter, use your Foldable to take notes, define terms, sketch diagrams, and explain the early stages of the life cycle.

### SPOTLIGHT ON HEALTH

Using Visuals. What steps can parents-to-be take to increase the chances of having a healthy baby?

# The Beginning of the Life Cycle

## Guide to Reading

### Building Vocabulary

As you read this lesson, write each new highlighted term and its definition in your notebook.

- ▶ fertilization (p. 486)
- ▶ implantation (p. 486)
- ▶ embryo (p. 486)
- ▶ fetus (p. 486)
- ▶ amniotic sac (p. 487)
- ▶ umbilical cord (p. 487)
- ▶ placenta (p. 487)
- ▶ labor (p. 490)

### Focusing on the Main Ideas

In this lesson, you will learn how to:

- ▶ **Identify** the stages of fetal development from conception through pregnancy and birth.
- ▶ **Explain** how a pregnant female transfers nutrients and other substances to her fetus.

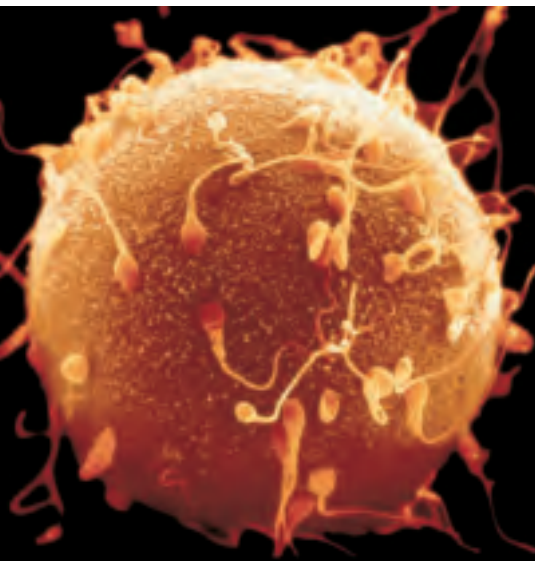
### Reading Strategy


**Predict**

- ▶ Scan the headings, subheadings, and photo captions. Write one paragraph describing what information you believe will be presented in this lesson.

### Quick Write

Write a short paragraph describing how important it is for mothers-to-be to eat a healthful diet.



 This human egg cell is surrounded by sperm. Chemical changes take place in the egg's surface so that only one sperm can fertilize it.

**D**id you know that your body is made of trillions of cells? These cells form the tissues and organs in your body. Yet your heart, lungs, skin, bones, and other body organs all began as a single cell that is smaller than the period at the end of this sentence.

## Conception and Implantation

**T**he entire complex human body begins as one microscopic cell that is formed by the union of an egg cell, or ovum, from a female and a sperm cell from a male. The *union of a male sperm cell and a female egg cell* is called **fertilization**, which is also known as *conception*. The resulting cell is called a *zygote* (ZY-goht).

Look at **Figure 19.1** on page 487. Notice that within a day after the zygote forms, it begins dividing as it travels down the fallopian tube. By the time it reaches the uterus, the zygote has divided many times to form a cluster of cells with a hollow space in the center. Within a few days, *the zygote attaches to the uterine wall* in the process called **implantation**. *The cluster of cells that develop between the third and eighth weeks of pregnancy* is called an **embryo** (EM-bree-oh). *After about the eighth week, this developing group of cells* is called a **fetus** (FEE-tuhs).



## Embryonic Growth

As the embryo grows, its cells continue to divide, forming three tissue layers that later become various body systems. One layer becomes the respiratory and digestive systems. A second layer develops into muscles, bones, blood vessels, and skin. A third layer forms the nervous system, sense organs, and mouth.

During this time two important structures form outside the embryo:

- ▶ The **amniotic** (am-nee-AH-tik) **sac** is a thin, fluid-filled membrane that surrounds and protects the developing embryo. It also insulates the embryo from temperature changes.
- ▶ The **umbilical** (uhm-BIL-uh-kuhl) **cord** is a ropelike structure that connects the embryo and the mother's placenta. The **placenta** (pluh-SEN-tuh) is a thick, blood-rich tissue that lines the walls of the uterus during pregnancy and nourishes the embryo.

Although the blood supply of the mother and the developing embryo are kept separate, materials diffuse from one blood supply to the other through the umbilical cord. Nutrients and oxygen pass from the mother's blood to the embryo, and wastes from the embryo diffuse into the mother's blood. The wastes are excreted from the mother's body along with her body wastes.

Substances that are harmful to the developing embryo can pass through the umbilical cord, too. If a pregnant female uses harmful substances, such as tobacco, alcohol, or other drugs, they can cross the placenta and harm the developing embryo.



### How do twins form?

Identical twins result when a single egg that has been fertilized by a single sperm divides and forms two embryos. Because they develop from the same zygote, identical twins have the same genetic information, are the same gender, and look almost exactly the same.

Fraternal twins form when a female's ovaries release two eggs. Separate sperm fertilize each egg, and two embryos develop. Each twin has a different genetic makeup, and they may or may not be the same gender. Fraternal twins do not resemble each other any more than other brothers and sisters do. Fraternal twins are much more common than identical twins.

FIGURE 19.1

## IMPLANTATION

Fertilization and implantation occur after an egg is released from the ovary.



**Fertilization**  
Only one sperm can fertilize an egg.

### Cell Division

As the zygote travels down the fallopian tube toward the uterus, it divides many times.

### Implantation

About six days after fertilization, the zygote burrows into the lining of the uterus.

## Reading Check

**Interpret** How many days after fertilization does the zygote enter the uterus lining (Figure 19.1)?

## Fetal Development

The time from conception to birth is usually about nine full months. These nine months are divided into three 3-month periods called *trimesters*. Read about the changes that take place during each trimester in **Figure 19.2**. Compare the images to see the growth of the fetus in each trimester.

FIGURE 19.2

### STAGES OF EMBRYONIC AND FETAL DEVELOPMENT

#### First Trimester (0 to 14 weeks)

#### Major Changes

##### 0–2 weeks

A zygote may float freely in the uterus for 48 hours before implanting. The spinal cord grows faster than the rest of the body. The brain, ears, and arms begin to form. The heart forms and begins to beat.

##### 3–8 weeks

The embryo is about 1 inch long at 8 weeks. The mouth, nostrils, eyelids, hands, fingers, feet, and toes begin to form. The nervous system can respond to stimuli. The cardiovascular system is fully functional.

##### 9–14 weeks

The fetus develops a human profile. Sex organs, eyelids, fingernails, and toenails develop. By week 12 the fetus makes crying motions but no sound and may suck its thumb.



During the period of growth in the uterus, the fetus develops in preparation for living outside the mother's body. Organs develop and become ready to function on their own. The fetus grows and gains weight. After about the seventh month, fat deposits are added under the skin to help the baby maintain body heat after birth. The fetus stores nutrients and builds immunity and protection from diseases and infections.

**Reading Check**

**Classify** What are the stages of fetal development called? How long does each stage last?

**Second Trimester  
(15 to 28 weeks)**

**Major Changes**

**15–20 weeks**

The fetus can blink its eyes. The body begins to grow, growth of the head slows, and the limbs reach full proportion. Eyebrows and eyelashes develop. The fetus can grasp and kick and becomes more active.

**21–28 weeks**

The fetus can hear conversations and has a regular cycle of waking and sleeping. Weight increases rapidly. The fetus is about 12 inches long and weighs a little more than 1 pound. The fetus may survive if born after 24 weeks but will require special medical care.



**Third Trimester  
(29 weeks to birth)**

**Major Changes**

**29–40 weeks**

The fetus uses all five senses and begins to pass water from the bladder. Brain scans have shown that some fetuses dream during their periods of sleep in the eighth and ninth months of development. Approximately 266 days after conception, the baby weighs 6 to 9 pounds and is ready to be born.



### Did You Know?



Immediately after birth a newborn is given an *Apgar* score. The *Apgar* test is used to assess an infant's physical condition at birth. The score measures appearance, heart rate, reflex irritability, activity, and respiration.

## Stages of Birth

In the final weeks of pregnancy, the fetus becomes more and more crowded in the uterus and puts increased demands on its mother's body. Most often the baby's head moves to the lower part of the uterus. Many females experience weak, irregular muscular contractions of the uterus for weeks or even months before the baby is born. As the time approaches for the baby to be born, however, these contractions become regular, stronger, and closer together. The stronger contractions induce **labor**, the final stage of pregnancy in which the uterus contracts and pushes the baby out of the mother's body. The stages of labor are summarized in **Figure 19.3**.

## Real-Life Application

### Fetal Ultrasound Technology

Ultrasound is a noninvasive technology that uses the reflection of sound waves to monitor a fetus in the uterus. A moving image of the developing fetus can be viewed on a monitor. Doctors can measure how the fetus is growing and whether organs such as the heart are developing properly. Ultrasound is used to determine the position of the fetus before birth.

Fetal ultrasound is harmless for the mother and child.

Only a trained specialist should interpret an ultrasound image.

In many cases gender can be determined with ultrasound.

Ultrasound can be done quickly in a doctor's office.

### ACTIVITY

Access print or online sources to investigate at least two other technologies used in fetal monitoring. Tell when and why each is used, cite your sources of information, and provide the criteria you used to evaluate your sources of valid health information. Write a paragraph explaining how fetal ultrasound technology helps protect the health of the mother and the unborn child.




Ultrasound is helpful for identifying twins and other multiple births.



FIGURE 19.3

## LEAVING THE WOMB

A female goes through three stages of labor to deliver a baby. Labor can last from a few hours to several days.

Stage 1: Dilation	Stage 2: Passage Through Birth Canal	Stage 3: Afterbirth
<p>The contractions of the uterus cause the cervix, the opening to the uterus, to begin to dilate, or widen. In about 95 percent of pregnancies, the baby's head is resting on the cervix. Toward the end of this stage, contractions break the amniotic sac that surrounds the baby.</p>	<p>When the cervix is fully dilated, the baby passes through the birth canal and emerges from the mother's body. Right after birth the baby takes its first breath and cries to clear the lungs of amniotic fluid.</p>	<p>The placenta is still attached to the baby by the umbilical cord. Contractions continue until the placenta, now called the <i>afterbirth</i>, is pushed from the mother's body. The umbilical cord is cut to separate the placenta from the baby.</p>
		

### LESSON

# 1

## REVIEW

### Reviewing Facts and Vocabulary

1. Define *fertilization* and *implantation*.
2. Explain fetal development from conception through pregnancy and birth.
3. How is a developing fetus nourished?

### Thinking Critically

4. **Synthesizing.** Considering what you learned about the female reproductive system in Chapter 18, explain what would happen if the zygote did not implant in the uterus after leaving the fallopian tube.
5. **Applying.** Explain how harmful substances taken in by a pregnant female can be transferred to a developing fetus. How might fetal development be affected?

### Applying Health Skills

**Accessing Information.** Research the changes that occur in a female's body during the nine months of pregnancy. Make an informative pamphlet that summarizes this information by trimester. Illustrate the pamphlet with pictures that show fetal development during each trimester.

### After You Read

**Explain.** Write a few sentences explaining how twins form. Include information describing the difference between identical and fraternal twins.



# Prenatal Care


## Guide to Reading

### Building Vocabulary

As you read this lesson, write each new highlighted term and its definition in your notebook.

- ▶ prenatal care (p. 492)
- ▶ birthing center (p. 492)
- ▶ fetal alcohol syndrome (FAS) (p. 494)
- ▶ miscarriage (p. 496)
- ▶ stillbirth (p. 496)



 Regular physical activity under the guidance of a health care professional, along with good nutrition, contribute to a healthy pregnancy.

### Focusing on the Main Ideas

In this lesson, you will learn how to:

- ▶ **Examine** prenatal care and proper nutrition for the baby and the mother.
- ▶ **Discuss** the harmful effects of certain substances on the fetus, such as tobacco, alcohol, other drugs, and environmental hazards.
- ▶ **List** complications during pregnancy such as miscarriage and stillbirth.

### Reading Strategy

**Cause and Effect**

- ▶ Draw a word web with “healthy baby” in the center, and Prenatal Care, Nutrition, Fetal Health, and Complications around the center. As you read, list facts under each heading.

### Quick Write

Write a short paragraph describing some positive health behaviors you think would benefit a developing fetus.

A female should begin prenatal care as soon as her pregnancy is confirmed to promote optimal health for both the baby and the mother. **Prenatal** (pree-NAY-tuhl) **care** refers to *steps that a pregnant female can take to provide for her own health and the health of her baby*. Obtaining prenatal care shows that you understand the impact of personal health behaviors on body systems.

## Importance of Prenatal Care

One of the first decisions a pregnant female must make is who will provide her prenatal care. An *obstetrician* (ahb-stuh-TRI-shuhn) is a doctor who specializes in the care of a female and her developing child. A *certified nurse-midwife* is an advanced practical nurse who specializes in prenatal care and delivering babies. In the United States, most births take place at a hospital, but some women choose to have the delivery at home or in a **birthing center**, *a facility in which women with low-risk pregnancies can deliver their babies in a homelike setting*.

During prenatal visits the female will have a complete physical that includes blood tests and a pelvic exam. The purpose of the exam is to identify problems so that they can be corrected or treated as early as possible. The obstetrician or nurse-midwife will monitor the mother's weight and blood pressure. Often the developing baby will be viewed with an ultrasound machine. These visits also give the parents-to-be the opportunity to ask questions and to learn about important behaviors that can help ensure the health of the baby.



**Explain** Why is proper nutrition so important during pregnancy?

## Proper Nutrition During Pregnancy

**A**n unborn baby depends on its mother for nourishment. For this reason, a pregnant female needs more nutrients than at any other time in her life. To ensure the optimal health of the developing fetus, increased amounts of many nutrients, including those below, are needed.


- ▶ **Calcium** helps build strong bones and teeth and healthy nerves and muscles. It is also important in developing heart rhythm.
- ▶ **Protein** helps form muscle and most other tissue.
- ▶ **Iron** makes red blood cells and supplies oxygen to cells.
- ▶ **Vitamin A** aids in cell and bone growth and eye development.
- ▶ **Vitamin B complex** aids in forming the nervous system.
- ▶ **Folic acid** is a critical part of spinal fluid and helps close the tube that contains the central nervous system. This neural tube forms 17 to 30 days after conception, so neural tube defects can occur before a female knows that she is pregnant. Health care providers suggest that all females of childbearing age consume 400 to 600 micrograms of folic acid daily to prevent these defects.

Although a pregnant female's nutritional requirements may increase, she must be careful not to gain too much weight. Most pregnant females need only 300 additional calories each day—about the number of calories found in two and a half cups of low-fat milk. Most health care professionals suggest that females who are at a healthy pre-pregnancy weight gain between 25 and 35 pounds during pregnancy. Excess weight can be a health risk for both mother and baby.

**T** Choosing nutritious foods, such as fruits and vegetables, and drinking milk during pregnancy can ensure that a mother-to-be receives the optimal amount of nutrients. *What nutrients are especially important for proper development of the fetus?*





 **Smokers inhale nicotine and carbon monoxide, both of which reach the fetus through the umbilical cord, preventing the fetus from getting enough nutrients and oxygen. *How might this affect fetal development?***

Weight-reduction diets during pregnancy can harm the developing fetus.

Caffeine, present in coffee, tea, chocolate, and many cola drinks, can affect the developing fetus. A high intake of caffeine during pregnancy has been linked to an increased risk of birth defects and low birth weight.

Physical activity can be beneficial to the pregnant female and developing child. Before starting any exercise program, the expectant mother should discuss the matter with her health care provider.

## The Health of the Fetus

A pregnant female shows that she understands the potential impact of common risk behaviors on the quality of her life and that of her unborn fetus by being very careful about the substances she takes into her body. Tobacco, alcohol, and other drugs used by the mother can enter the body of the developing fetus and have harmful effects.

### Tobacco and Pregnancy

Smoking during pregnancy is harmful to the fetus. It is estimated that smoking accounts for up to 30 percent of low birth weight babies, 14 percent of premature births, and 10 percent of all infant deaths. Studies suggest that a pregnant female's smoking may also affect the growth, mental development, and behavior of her child until he or she is 11 years old.

The responsibility to provide a smoke-free environment extends beyond the expectant mother. According to the American Lung Association, pregnant females exposed repeatedly to secondhand smoke also have an increased risk of having a low birth weight baby. Low birth weight is a leading cause of death for children under 12 months old.

### Alcohol and Pregnancy

Any alcohol consumed during pregnancy quickly passes through the umbilical cord to the fetus. The fetus breaks down alcohol much more slowly than an adult does, so the alcohol level in the fetus's blood can be higher than that of the mother and remain higher for a longer period of time. An elevated alcohol level can result in permanent damage to the fetus and a condition known as **fetal alcohol syndrome (FAS)**, a group of alcohol-related birth defects that includes both physical and mental problems. The serious, lifelong consequences of FAS are listed at the left.

The tragedy of **FAS** is that it is entirely preventable. The safe decision for pregnant females and females considering pregnancy is not to drink any alcoholic beverages.

#### Did You Know?

Children with FAS suffer lifelong consequences, including

- mental retardation.
- learning disabilities.
- serious behavior problems.
- slowed growth.
- physical deformities, including a small skull, abnormal facial features, and heart defects.

## Medicines, Other Drugs, and Pregnancy

Using **drugs** when pregnant can have serious consequences. During pregnancy even prescription and over-the-counter **medicines** should be taken only with the approval of a doctor or other qualified health care provider.

Using illegal drugs when pregnant poses a serious health threat to both the mother and the fetus. Drug abuse can harm the mother's health and make her less able to support the pregnancy. Drugs also can directly harm fetal development. The use of certain illegal drugs during pregnancy can cause serious birth defects, premature labor, or miscarriage. In addition, a baby can be born addicted to the drugs the mother uses during pregnancy. The infant will suffer withdrawal when it no longer receives the drugs after birth. The baby may be hypersensitive and irritable and may cry for hours. It may tremble and jerk. A baby born addicted to drugs may fail to bond with its parents as normal babies do.



**Determine** What are some of the lifelong consequences for children with fetal alcohol syndrome (FAS)?

# Hands-On Health ACTIVITY

## Tips for a Healthy Pregnancy

In this activity you will write and design a brochure explaining how to access health services to ensure a healthy pregnancy for pregnant females. Keep in mind that prenatal care isn't just the responsibility of the mother-to-be. Expectant fathers, for example, can buy and prepare healthful food and accompany their wives to medical visits and childbirth classes.

### What You'll Need

- construction paper
- colored markers or pens
- magazines or newspapers


### What You'll Do

1. Fold the construction paper to make a three-panel pamphlet.
2. Using the information in this chapter, write at least five tips for a healthy pregnancy. Under each tip, include actions both parents should take to ensure that their baby is healthy.
3. Illustrate your pamphlet with photos from magazines or newspapers, or draw your own illustrations. Make your pamphlet persuasive, and target it to expectant parents.
4. Share your pamphlet with the class.

### Apply and Conclude

As a class, combine the best features of all the pamphlets to create one pamphlet. Make copies, and give them to family members who are expecting a child or planning a family.



 Although most pregnancies progress without complications, certain environmental factors can affect the healthy development of a fetus. *What steps can a mother-to-be take to protect the health of her unborn child?*

## Environmental Hazards

Harm to the fetus can result when a pregnant female is exposed to some common substances in the environment. Being familiar with these substances can help a female avoid exposing her unborn child to their harmful effects. A prepared family member understands how the environmental conditions of the community influence the health of individuals.

- ▶ **Lead.** Lead exposure has been linked to miscarriages, low birth weight, mental disabilities, and behavior problems in children. Lead can be found in the paint of houses built before 1978.
- ▶ **Smog.** Recent studies have linked air pollution with birth defects, low birth weight, premature birth, stillbirth, and infant death. The greatest risk occurs during the second month of pregnancy when most organs and facial features develop.
- ▶ **Radiation.** Ionizing radiation—the type found in X rays—can affect fetal growth and cause mental retardation.
- ▶ **Cat Litter.** Cat feces may contain a parasite that can cause a disease called toxoplasmosis (tahk-suh-plaz-MOH-suhs). This disease can result in miscarriage, premature labor, and health problems in a newborn. Pregnant females should wash their hands after petting a cat, have others clean the cat litter box, and wear gloves when gardening where cats may be present.

In addition, when using household chemicals, pregnant females should read the cautions on cleaning products, wear gloves, and work in well-ventilated areas.

## Complications During Pregnancy

Most pregnancies proceed with few problems. However, complications can arise, some of them serious. Health-literate individuals can assess behaviors and decisions as to the likelihood of resulting in infant death and disability. One complication is **miscarriage**, the spontaneous expulsion of a fetus that occurs before the twentieth week of a pregnancy. A **dead fetus expelled from the body after the twentieth week** is called a **stillbirth**. Women who use tobacco or drugs during pregnancy are more likely to experience a miscarriage or stillbirth than those who abstain from these substances. A miscarriage or stillbirth doesn't necessarily mean that the mother did something wrong. Receiving the proper prenatal care during pregnancy can reduce the risk or severity of any problems that do arise.

## Ectopic Pregnancy

Ectopic (ek-TAH-pik) pregnancies result when the zygote implants in the fallopian tube, the abdomen, the ovary, or the cervix. Ectopic pregnancy can occur when the fertilized egg can't pass to the uterus, sometimes because of inflammation or scar tissue that has developed as a result of **sexually transmitted diseases**. The fetus can't get the nourishment it needs to grow normally. The situation is a threat to the pregnant female's life. Ectopic pregnancy is the number one cause of death of females in the first trimester of pregnancy. The treatment of ectopic pregnancy is removal of the fetus from the female's body.

## Preeclampsia

Preeclampsia (pree-ee-CLAMP-see-ah), also called toxemia, can prevent the placenta from getting enough blood. The condition may result in low fetal birth weight and problems for the mother. Symptoms of preeclampsia in a pregnant female include high blood pressure, swelling, and large amounts of protein in the urine. Treatment includes reducing blood pressure through bed rest or medicines. In some cases, hospitalization is necessary.

### Did You Know?

In the United States 2 to 5 percent of pregnant females are diagnosed with gestational diabetes mellitus, or GDM. It usually disappears after the baby's birth.

## LESSON

# 2

## REVIEW

### Reviewing Facts and Vocabulary

1. Explain the importance of prenatal care in promoting optimal health for both the baby and the mother.
2. Define the term *stillbirth*.
3. Analyze the harmful effects of certain substances on the fetus. Why should pregnant females avoid drugs, alcohol, and tobacco?

### Thinking Critically

4. **Evaluation.** Suppose someone told you that pregnancy is a natural process so prenatal care is not important. What information would you give such a person?
5. **Synthesizing.** Analyze the harmful effects on the fetus of environmental hazards. Name the factors that affect a developing fetus over which a pregnant female has control.

### Applying Health Skills

**Stress Management.** Pregnancy causes extra stress on the body of the mother. Along with these physical stresses come concerns about the health of the baby and about parent-hood. Make a list of healthful "stress-busters" pregnant females could use. Share your list with families who are expecting a child.

### After You Read

**Cause and Effect.** Write a paragraph explaining the cause and effect of using tobacco, alcohol, and other drugs on the fetus.



# Heredity and Genetics

## Guide to Reading

### Building Vocabulary

As you read this lesson, write each new highlighted term and its definition in your notebook.

- ▶ heredity (p. 498)
- ▶ chromosomes (p. 499)
- ▶ genes (p. 499)
- ▶ DNA (p. 499)
- ▶ genetic disorder (p. 500)
- ▶ amniocentesis (p. 501)
- ▶ chorionic villi sampling (CVS) (p. 501)
- ▶ gene therapy (p. 503)

### Focusing on the Main Ideas

In this lesson, you will learn how to:

- ▶ **Examine** genetics and its role in fetal development.
- ▶ **Identify** common genetic disorders.
- ▶ **Analyze** genetic research and technology and their impact on the health of people with genetic disorders.

### Reading Strategy

**Organize Information**

- ▶ **Make a word web** with “heredity” at the center. Surround with bubbles labeled **Chromosomes, Genes, DNA, Fetal Development, Genetic Disorders, and Gene Research**. As you read, fill in the appropriate facts.

### Quick Write

**Make a list of some of the ways a family you know looks alike. Describe why you think this likeness might be genetic.**

**T** Family members often share a strong physical resemblance. *What inherited characteristics are visible in this family?*

No two individuals are exactly alike. Even identical twins have some differences. What accounts for this variety of traits? A number of factors influence the way an individual develops. One significant factor is heredity.

## Heredity

The passing of traits from parents to their children is called **heredity**. Examples of traits that you inherited from your parents are your eye and hair color and the shape of your earlobes. Environment can also influence inherited traits. For example, height is an inherited trait, but poor nutrition may stunt a child’s growth.



## Chromosomes and Genes

Most cells in your body contain a nucleus—the cell’s control center. Inside each nucleus is a set of **chromosomes** (KROH-muh-sohmz), *threadlike structures found within the nucleus of a cell that carry the codes for inherited traits*. Most cells in the body contain 46 chromosomes arranged as 23 pairs.

Sections of chromosomes, called genes, carry codes for specific traits. **Genes** are *the basic units of heredity*. Like chromosomes, genes occur in pairs. One gene from each pair is inherited from each parent. You have thousands of genes in every cell of your body.

## DNA


The chemical unit that makes up chromosomes is called **DNA**, or deoxyribonucleic (dee-AHK-si-REYE-boh-nyoo-KLEE-ik) acid. All living things are made of DNA. Chemical compounds, called bases, make up the structure of DNA. The arrangement of the bases along each DNA molecule differs. Because several thousand pairs of bases are in each gene, countless numbers of arrangements are possible. The order of the bases is called the *genetic code*. Cells use the genetic code to make proteins. Proteins help to build and maintain body tissues. Different kinds of proteins result in various individual traits. All the characteristics that you have—the color of your eyes, the amount of curl in your hair, and your height—are determined by your genetic code. Unless you have an identical twin, your DNA is different from that of any other person.

## Genetics and Fetal Development

**E**very living organism has a certain number of chromosomes. Although most human cells contain 46 chromosomes—23 pairs—sperm and egg cells have only half that amount, or 23 chromosomes. When a sperm and an egg unite, the resulting zygote will have 46 chromosomes—23 from each parent. These chromosomes carry the hereditary traits of the parents. Health-literate individuals understand the ways that heredity and environment affect human growth and development.

As you learned in Lesson 1, a zygote divides many times, producing the trillions of cells that make up the human body. Between each cell division, each chromosome in the cell nucleus duplicates itself, producing two sets of 46 chromosomes. As the cell divides, the two sets of chromosomes separate. Each new cell will contain one set of 46 chromosomes that are identical to those in the first cell of the zygote.



 **DNA resembles a long twisted helix, with ladder-like chains. Nitrogen bases make up the rungs of the ladder. Give an example of a trait that is determined by genes.**



**Y** Human X and Y chromosomes determine gender. Each of the body cells in a male has an X and a Y chromosome. Each body cell in a female has two X chromosomes.

*Explain why the sperm, not the ovum, determines the gender of a fetus.*



## Dominant and Recessive Genes

At least one pair of genes is responsible for each human trait. Some genes are *dominant*, and others are *recessive*. The traits of dominant genes generally appear in offspring whenever they are present. The traits of recessive genes usually appear only when dominant genes are not present. For example, suppose an individual receives two genes for eye color—one for brown eyes and one for blue eyes. The resulting individual will have brown eyes because the gene for brown eyes is dominant and the gene for blue eyes is recessive. An individual with blue eyes must have two recessive genes for blue eye color.

The situation is more complex than in the example above because traits that express a quantity or an extent—such as height, weight, or color—usually depend on many gene pairs, not just one.

## Genes and Gender

In humans one pair of chromosomes determines the gender of an individual. If you are female, these two chromosomes look exactly alike and are called X chromosomes. If you are male, the two chromosomes differ—one is shorter than the other. The shorter chromosome is the Y chromosome. The longer one is the X chromosome.

Remember that sperm and egg cells contain only half the chromosomes of other cells, or one sex chromosome, not two. Sperm contain an X or a Y chromosome. Eggs have only an X chromosome. The gender of a child is determined by which type of sperm—X or Y—unites with an egg.

## Genetic Disorders

Sometimes the genes that an individual inherits contain a *mutation*, or abnormality, in the base sequence of the genetic code. Often the mutation has little or no effect on the individual, but sometimes the mutation can result in defects or other health problems. **Genetic disorders** are *disorders caused partly or completely by a defect in genes*. Some genetic disorders, such as those that cause birth defects, are apparent right away. One example of such a defect is cleft palate. However, other genetic disorders do not show up until later in life. **Figure 19.4** gives information about some common genetic disorders.

FIGURE 19.4

## COMMON HUMAN GENETIC DISORDERS

Disorder	Characteristics
<b>Sickle-cell anemia</b>	Red blood cells have a sickle shape and clump together; may result in severe joint and abdominal pain, weakness, kidney disease, restricted blood flow
<b>Tay-Sachs disease</b>	Destruction of nervous system; blindness; paralysis; death during early childhood
<b>Cystic fibrosis</b>	Mucus clogs many organs, including lungs, liver, and pancreas; nutritional problems; serious respiratory infections and congestion
<b>Down syndrome</b>	Varying degrees of mental retardation, short stature, round face with upper eyelids that cover inner corners of the eyes
<b>Hemophilia</b>	Failure of blood to clot

Although most genetic disorders cannot be cured, in some cases they can be treated, especially if they are diagnosed early—often before birth. Two common technologies used to test for genetic disorders are amniocentesis (am-nee-oh-sen-TEE-sis) and chorionic villi (kor-ee-ON-ik VIL-eye) sampling.

- ▶ **Amniocentesis** is a procedure in which a syringe is inserted through a pregnant female's abdominal wall into the amniotic fluid surrounding the developing fetus. Doctors can examine the chromosomes in fetal cells taken from amniotic fluid for genetic abnormalities or to determine the gender and age of the fetus. Amniocentesis is usually performed 16 to 20 weeks after fertilization.
- ▶ **Chronic villi sampling**, or **CVS**, is a procedure in which a small piece of membrane is removed from the chorion, a layer of tissue that develops into the placenta. The tissue can be examined for genetic disorders or to determine fetal age and gender. The procedure is done around the eighth week of fetal development.

Tests for genetic disorders may also be done after a child is born. For example, many states require the testing of all newborns for phenylketonuria (PKU). If PKU is diagnosed soon after birth, a baby's diet can be altered to stop possible mental retardation caused by this genetic disorder.

### Reading Check

#### Compare and Contrast

What is the difference between dominant and recessive genes?



Health care professionals can check the health of a fetus using a variety of testing procedures. *How can the age of a fetus be determined?*



# Resilient TEENS

Lara Brown was born in Korea and came into the world with a cleft lip and palette, and severe dyslexia. "I was always aware of my physical appearance," says Lara, "and embarrassed by the way I would mess up language."

Lara became depressed and withdrawn and for a year was bulimic. "I wouldn't face my own feelings," she says.

Gradually, however, Lara's natural love of self-expression began to assert itself. She began writing about her experiences that were eventually published as the book *121 Ways to Say "I Love You" to Your Teenage Daughter*.

"Over time I let go of all the feelings that were like pieces of broken glass inside me," says Lara. "I've learned that I don't have to go through issues alone."



**"Over time I let go of all the feelings that were like pieces of broken glass inside me."**

Reading Check

**Explain** How do you think writing helped Lara get in touch with her feelings?

Reading Check

**Explain** What can happen when a person's genes contain a mutation or abnormality?

## Genetic Counseling

Research for diagnosing, preventing, and treating genetically related diseases has resulted in a wide variety of programs. Genetic counseling is one way that the prevention and control of health problems are influenced by research and medical advances. Genetic counselors can guide families of children with genetic disorders regarding possible treatment options.

## Genetic Research to Cure Disease

Scientists have taken an important step in understanding and treating genetic disorders. The Human Genome Project has successfully identified the approximately 30,000 genes on the 46 human chromosomes. Gene maps can be used to diagnose genetic disorders.

## Gene Therapy

Many disorders result when an individual lacks a functioning gene. Without the functioning gene, certain substances that the body needs are not produced. **Gene therapy** is the process of inserting normal genes into human cells to correct genetic disorders. When the defective gene is replaced with a normal one, the cells with the new gene begin to make the missing substance. The practice of placing fragments of DNA from one organism into another is called *genetic engineering*, and it is considered highly experimental. Genetic diseases for which scientists are researching gene therapies include cystic fibrosis and various types of cancer. It is important to know how the prevention and control of health problems are influenced by research and medical advances.

## Genetically Engineered Drugs

Genes used to treat disease aren't usually inserted directly into human beings. Instead they are placed into other organisms, causing them to produce substances that can be used to treat human diseases and disorders. Genetic engineering is also used to produce some vaccines that prevent diseases. It's important to understand the impact of technology on personal, family, and community health.

### Did You Know?

Two purposes of the Human Genome Project are to identify all of the genes in human DNA and to determine the sequences of the 3 billion base pairs that make up human DNA. A working draft of the entire human genome sequence was announced in June 2000. Scientists hope to use the information from the project to improve diagnosis and treatment for approximately 4,000 human genetic disorders.

## LESSON

# 3

## REVIEW

### Reviewing Facts and Vocabulary

1. What is *heredity*?
2. Name three human genetic disorders.
3. Explain the difference between *amniocentesis* and *chorionic villi sampling (CVS)*.

### Thinking Critically

4. **Analyzing.** Explain the significance of genetics and its role in fetal development.
5. **Synthesizing.** Explain how genetic research technology has impacted the health status of families. How might a genetic counselor help a family that has just learned that their child may have inherited a genetic disorder?

### Applying Health Skills

**Accessing Information.** Research a particular genetic disorder. Prepare a presentation that summarizes the cause, symptoms, and treatment of the disorder and the latest research being conducted. Explain how technology has impacted the health status of individuals, families, communities, and the world.

### After You Read

**Explain.** Write a brief paragraph explaining what causes genetic disorders and how can they be diagnosed.



# Infancy and Childhood

## Guide to Reading

### Building Vocabulary

As you read this lesson, write each new highlighted term and its definition in your notebook.

- ▶ developmental tasks (p. 504)
- ▶ autonomy (p. 505)
- ▶ scoliosis (p. 507)

### Focusing on the Main Ideas

In this lesson, you will learn how to:

- ▶ Identify the developmental tasks of childhood.
- ▶ Discuss state laws and community services that provide vision and hearing screenings and immunization programs for children.

### Reading Strategy

Describe

- ▶ Write a brief paragraph describing the four stages of childhood development.

### Quick Write

Write a short paragraph describing why it is important to choose age-appropriate toys for children.



Children often imitate the behavior of adults. **What are some examples of positive behaviors adults can display when they are around children?**

Dramatic physical and mental changes take place as an infant grows through childhood. Many scientists have studied these changes, and they have developed different theories about them. One of the most widely accepted theories of development is that of psychologist Erik Erikson.

## Childhood Development

According to Erikson, each individual passes through eight developmental stages during his or her life. Each stage is characterized by **developmental tasks**, events that need to happen in order for a person to continue growing toward becoming a healthy, mature adult. Success in each stage is dependent on an individual's experiences during that stage. Partial development at one stage can be overcome by developmental successes in following stages. The four stages that apply to infancy and childhood are summarized in **Figure 19.5**.





### Infancy

Infancy is the period of fastest growth in a person's life. During this time a child's weight may triple, and his or her height may

FIGURE 19.5

## STAGES OF INFANCY AND CHILDHOOD

Each stage of development is associated with a developmental task that involves a person's relationship with other people.

Stage 1	Stage 2	Stage 3	Stage 4
			
<p><b>Infancy:</b> Birth to 1 year  <b>Task:</b> To develop trust  <b>Description:</b> Infant is completely dependent on others to meet his or her needs. Must be able to trust others to provide for needs.</p>	<p><b>Early Childhood:</b> 1 to 3 years  <b>Task:</b> To develop ability to do tasks for oneself  <b>Description:</b> Child learns to walk, talk, and dress and feed himself or herself. Self-control and confidence begin to develop, and child begins desiring independence.</p>	<p><b>Middle Childhood:</b> 4 to 6 years  <b>Task:</b> To develop responsibility, take initiative, to create one's own play  <b>Description:</b> Child becomes more engaged in interactions with others. Models adult behavior by helping with household chores. Learns to control impulses.</p>	<p><b>Late Childhood:</b> 7 to 12 years  <b>Task:</b> To develop an interest in performing activities  <b>Description:</b> Child completes transition from home to school; learns to make things, use tools, and acquire skills.</p>

increase by 50 percent. Infancy is a time of learning—how to eat solid food and how to sit, crawl, and walk. An important task for an infant is developing trust. Infants of parents who are attentive—who play with and talk to the infant and give comfort—learn to view the world as a safe place. These children see people as being dependable. If parents ignore a child's needs, the child may learn to be distrustful.

### Early Childhood

Children in early childhood begin to feel proud of their accomplishments, and they become eager to learn more. During this time children develop many new skills. They learn to talk, climb, push, and pull. They increase their vocabulary and begin talking in sentences. If parents accept the child's need to do whatever he or she is capable of, the child will develop a sense of **autonomy**, *the confidence that a person can control his or her own body, impulses, and environment*. If parents are overprotective or critical of the child's behaviors, the child may develop doubts about his or her abilities.



**Describe** What is a developmental task?

## CHARACTER CHECK

**Caring.** When a child feels understood and physical and emotional needs are met, he or she will thrive. Take the time to listen attentively and show that you care whenever you have a chance to help a toddler or young child.

**Think of ways you demonstrate caring with younger siblings or other children.**

## Middle Childhood

During middle childhood children learn to initiate play activities rather than merely following the lead of others. Children of this age display their intelligence by asking many questions. They must learn to recognize emotions and practice expressing them in appropriate ways. If parents show approval of these new abilities and encourage questions, children learn creativity, initiative, and the ability to start something on their own. Children of parents who are impatient with the child may develop a sense of guilt about self-initiated activities, resulting in low self-esteem.

## Late Childhood

During late childhood school becomes an important part of a child's life. Children develop skills in reading, writing, and math. Children learn to get along with peers, learn appropriate roles in society, and develop a conscience. If their efforts are rewarded and

# Health Skills Activity

## Decision Making: Choosing Toys

Colleen is buying a gift for her sister's second birthday. She and her friend, Amanda, are in the toy store. "What about this puzzle?" asks Amanda.

"That's cute," Colleen replies, "but it looks complicated. What if she chokes on the small pieces?"

"Maybe a ride-on toy?" Amanda suggests. "My little brother loves his tricycle."

"Those are fun," Colleen agrees. "But you have to make sure they're stable, so the child doesn't tip over. There are a lot of safety issues to consider when you get a toy for a child."

Amanda sighs. "Maybe we need to do some research to find out what two-year-olds can play with."

"The party is tomorrow," Colleen replies. "I don't have a lot of time for research."



## What Would You Do?

*How can Colleen find out more about age-appropriate toys? Apply the six steps of the decision-making process to Colleen's situation.*

1. State the situation.
2. List the options.
3. Weigh the possible outcomes.
4. Consider values.
5. Make a decision and act.
6. Evaluate the decision.

appreciated, their pride in their work increases. Children who are scolded for making a mess, getting in the way, or not following directions may develop feelings of self-doubt.

## Health Screenings in Childhood

Vision and hearing impairments can affect a child's development as much as social factors do. Immunizations and health screenings can prevent many problems.

### Vision and Hearing

According to the CDC, nearly one in every 1,000 children in the United States has low vision or is legally blind. The American Academy of Ophthalmology recommends that vision screenings be given to newborns and regularly throughout childhood. Schools often provide regular vision screenings for students.

In the United States, two to three of every 1,000 infants are born with a hearing impairment severe enough to affect language development. Some state laws require that newborns be screened at birth for hearing loss. Schools often provide periodic screenings.

### Scoliosis

**Scoliosis**, an abnormal lateral, or side-to-side, curvature of the spine, may begin in childhood and go unnoticed until the teen years. Its exact cause is unknown, though it is more common in girls. Many public schools make it a policy check for scoliosis in middle school.

#### Did You Know?

At birth a male has a covering of thin loose skin, called the *foreskin*, over the tip of the penis. Some parents choose *circumcision*—surgical removal of the foreskin of the penis—for their male children. Circumcision is often performed for cultural or religious reasons, but is not generally considered medically necessary today.

## LESSON

# 4

## REVIEW

### Reviewing Facts and Vocabulary

1. Define *developmental tasks*. List three developmental tasks of infancy and childhood.
2. What developmental task must be accomplished in early childhood?
3. Which health screenings are usually provided by schools?

### Thinking Critically

4. **Synthesizing.** How do the actions of parents contribute to the developmental tasks of their children?
5. **Evaluating.** Do you think that all states should have laws requiring regular health screenings for children? Explain your answer.

### Applying Health Skills

**Accessing Information.** Research various school and community health services for people of all ages such as vision and hearing screenings and immunization programs. If appropriate, post your findings on a class Web site.

### After You Read

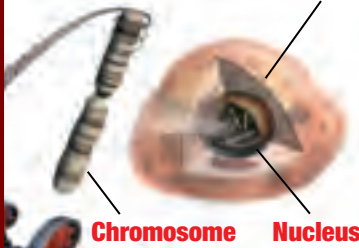
**Analyze a Graph.** Using Figure 19.5, write a summary describing at least two activities that infants and children are likely to accomplish during that stage of their development.





# How DNA Works

**Cell Width** 10 to 30 micrometers (a micrometer is one-thousandth of a millimeter)



**Chromosome** **Nucleus**

**DNA strand** Length of one turn: 34 angstroms (an angstrom is one ten-millionth of a millimeter)

**DNA** is twisted into packets, called chromosomes, that are tucked into the nucleus of each cell. The blueprints for making proteins are stretches of DNA called genes. Genes spell out instructions in four-letter codes: *A*, *T*, *G*, and *C*.

**Diameter:** 20 angstroms

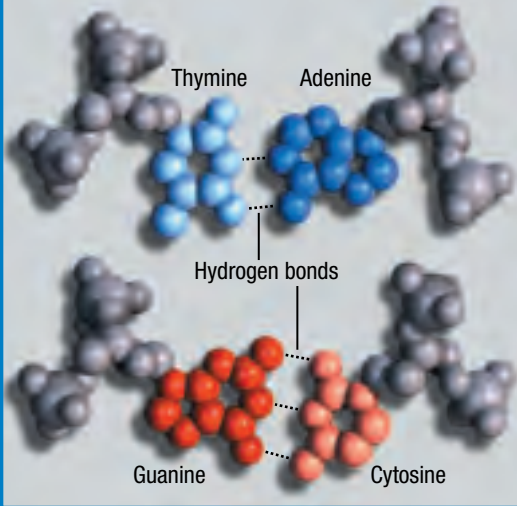
**DNA is a self-reproducing molecule that carries instructions from one generation to the next—and it's beautiful!**

**DNA backbone**

**DNA bases**

To make a copy of itself, DNA unzips into two half-ladders that are reverse images of each other. Each half rebuilds itself from components stored in the cell. *As* always bond with *Ts* and *Gs* bond with *Cs*, so the copies are identical.

The base pairs attach to each other with hydrogen bonds.



**TIME**  
to **THINK...**

**About DNA**

The structure of DNA may seem simple, but discovering that structure was anything but simple. Using the Internet and your school's media center, explore the work of James Watson and Francis Crick. Report to class the role of these two scientists in uncovering the mysteries of DNA.

## Health Skills Application



**1. Accessing Information.** Choose a human body system. Research its development before birth. Prepare a visual report of your findings. (LESSON 1)



**2. Communicating.** Research and analyze the effects of secondhand smoke on a developing fetus. Write a dialogue in which a pregnant woman uses this factual information and “I” messages to communicate her desire for a person not to smoke in her presence. (LESSON 2)



**3. Advocacy.** Research a genetic disorder that interests you. Find out what organizations are currently doing research on the disease and how this research is funded. Write a letter to the funding organization urging them to continue their support. (LESSON 3)



**4. Practicing Healthful Behaviors.** Identify screening and immunization programs in your community. What screenings and immunizations are required by your state? By your school district? How would you access these health services? Explain how to access these health services for people of all ages. (LESSON 4)

## CAREER Corner

### Pediatrician

Being a physician who specializes in treating children from birth through the teen years takes patience, understanding, and a lot of education.



Pediatricians get a four-year college degree and then complete four years of medical school. This is followed by three or more years of residency training in pediatrics. Some pediatricians have additional training in specialties such as neonatal care or heart diseases in children. Find out more about this and other health careers by clicking on Career Corner at [health.glencoe.com](http://health.glencoe.com).

## BEYOND the Classroom

### Parent Involvement

**Analyzing Influences.** Talk with a parent or other adult family member about the responsibilities of parenthood. Share Erikson’s stages of infancy and early, middle, and late childhood, and discuss how your family helped you move successfully from one stage to another.

### School and Community

**Child Care.** Invite a child psychologist to your school to discuss the developmental tasks of children. Have the person explain the positive behaviors that caregivers can use to help ensure that the children they care for become healthy, mature adults. Then use the information to prepare a pamphlet for all babysitters to read.

**After You Read**

Use the notes you have taken in your Foldable to write an expository paragraph explaining the stages of fetal development from conception to birth.



► **EXPLORING HEALTH TERMS** Answer the following questions on a sheet of paper.

**Lesson 1** Replace the underlined words with the correct term.

<b>amniotic sac</b>	<b>implantation</b>
<b>embryo</b>	<b>labor</b>
<b>fertilization</b>	<b>placenta</b>
<b>fetus</b>	<b>umbilical cord</b>

- The final stage of pregnancy, in which the uterus contracts and pushes the baby out of the mother's body, is fertilization.
- The ropelike structure that connects the embryo and the placenta is the fetus.
- The amniotic sac is the thick, blood-rich tissue that lines the walls of the uterus and nourishes the embryo during pregnancy.

**Lesson 2** Match each definition with the correct term.

<b>birthing center</b>	<b>prenatal care</b>
<b>stillbirth</b>	<b>fetal alcohol syndrome (FAS)</b>
<b>miscarriage</b>	

- A facility in which females with low-risk pregnancies can deliver their babies in a homelike setting.
- A group of alcohol-related birth defects.
- The spontaneous expulsion of a fetus that occurs before the twentieth week of a pregnancy.

**Lesson 3** Fill in the blanks with the correct term.

<b>CVS</b>	<b>genetic disorder</b>
<b>DNA</b>	<b>chromosomes</b>
<b>genes</b>	<b>heredity</b>
<b>gene therapy</b>	<b>amniocentesis</b>

- The threadlike structures found within the nucleus of a cell that carry the codes for inherited traits are called \_\_\_\_\_.
- The basic units of heredity are \_\_\_\_\_.
- The chemical units that make up chromosomes are called \_\_\_\_\_.
- A defect in genes can result in a(n) \_\_\_\_\_.

**Lesson 4** Fill in the blanks with the correct term.

<b>autonomy</b>	<b>scoliosis</b>
<b>developmental tasks</b>	

- \_\_\_\_\_ is/are a series of events that must happen in order for an individual to continue growing toward becoming a healthy, mature adult.
- \_\_\_\_\_ is/are the confidence that a person can control his or her own body, impulses, and environment.
- An abnormal sideways curvature of the spine is \_\_\_\_\_.

► **RECALLING THE FACTS** Use complete sentences to answer the following questions.

- From where does a zygote's DNA originate?
- What is the function of the amniotic sac?
- Summarize the three stages of labor.
- What happens during a prenatal visit to a doctor or certified nurse-midwife?



5. Why is nutritional counseling during pregnancy important?
6. List four environmental hazards that can harm a fetus.
7. Explain the role of genetics in fetal development. If a baby boy receives a dominant gene for brown eyes and a recessive gene for blue eyes, what color will his eyes be?
8. How does the genetic makeup of a male differ from that of a female?
9. How might impatience toward someone in middle childhood affect the development of that child?
10. How soon after birth should an infant have a hearing screening?
11. When is a child commonly checked for scoliosis?

### ▶ WRITING CRITICALLY

1. **Descriptive.** Write an article providing information for future mothers on how to care for their unborn babies during pregnancy. Include quotes from an expert and from a mother describing the types of things she did to care for her baby and herself.
2. **Narrative.** Write a one-page story describing a child in one of the childhood developmental stages. In the story, use specific examples showing how the child demonstrates characteristics of that particular stage. Make sure that your story includes interesting characters, setting, and plot that tells a clear story arranged in a logical order.

## Standardized Test Practice



The purpose of persuasive writing is to convince the reader to accept your opinion or to take a specific action. The *Writing Situation* focuses on the effects of positive reinforcement and encouragement on young children. The *Directions for Writing* suggests that you think about these effects as you demonstrate how parents and caregivers can give children positive reinforcement and encouragement in different situations.

### PROMPT

**Writing Situation:** In this chapter you learned about the infancy and childhood stage of development. You have been asked to create a brochure that teaches new parents the importance of positive reinforcement and encouragement on young children ages 2–4.

**Directions for Writing:** Think about the effects of positive reinforcement and encouragement of young children. Keep in mind the effects of the lack of such reinforcement on a child’s growth and development.

Now write to convince parents and caregivers to provide positive reinforcement and encouragement daily. Remind your audience that positive reinforcement and encouragement can be shown in a variety of situations, such as at home, in preschool, in parks, restaurants, and other public places. Use specific situations and suggestions to get your point across.