CHAPTER 3
PRENATAL DEVELOPMENT, BIRTH, AND THE NEWBORN BABY

CHAPTER-AT-A-GLANCE

Chapter Outline	Instruction Ideas	Supplements
Prenatal Development pp. 61–66 Conception • Germinal Period • Period of the Embryo • Period of the Fetus	Learning Objective 3.1 Learning Activities 3.1 Ask Yourself p. 66	Test Bank Items 1–29, 110 *(Please contact your Pearson sales representative for a wide range of video offerings available to adopters.)*
Prenatal Environmental Influences pp. 66–75 Teratogens • Other Maternal Factors • The Importance of Prenatal Health Care	Learning Objectives 3.2–3.4 Lecture Enhancement 3.1 Lecture Enhancement 3.2 Learning Activities 3.1, 3.3–3.5 Ask Yourself p. 75	Test Bank Items 30–61, 111–112
Childbirth pp. 75–76 The Stages of Childbirth • The Baby's Adaptation to Labor and Delivery • Assessing the Newborn's Physical Condition: The Apgar Scale	Learning Objective 3.5 Learning Activities 3.2, 3.7	Test Bank Items 62–70, 113
Approaches to Childbirth pp. 77–78 Natural, or Prepared, Childbirth • Home Delivery	Learning Objective 3.6 Learning Activities 3.2	Test Bank Items 71–74
Medical Interventions pp. 78–79 Fetal Monitoring • Labor and Delivery Medication • Cesarean Delivery	Learning Objective 3.7 Learning Activity 3.2 Ask Yourself p. 79	Test Bank Items 75–82
Preterm and Low-Birth-Weight Infants pp. 79–81 Preterm versus Small-for-Date Infants • Consequences for Caregiving • Interventions for Preterm Infants	Learning Objective 3.8 Learning Activities 3.5 Ask Yourself p. 81	Test Bank Items 83–90,
The Newborn Baby's Capacities pp. 81–88 Reflexes • States of Arousal • Sensory Capacities	Learning Objectives 3.9–3.10 Learning Activities 3.6 Ask Yourself p. 88	Test Bank Items 91–108,114
Adjusting to the New Family Unit p. 88	Learning Objective 3.11 Learning Activity 3.7	Test Bank Items 109

BRIEF CHAPTER SUMMARY

The vast changes that occur during pregnancy are usually divided into three periods: (1) the germinal period, (2) the period of the embryo, and (3) the period of the fetus. Various environmental agents, or teratogens, and other maternal factors, including poor nutrition and emotional stress, can damage the developing organism. Early and sustained prenatal health care is vital to ensure the health of mothers and babies.

The process of childbirth naturally divides into three stages: (1) dilation and effacement of the cervix, (2) delivery of the baby, and (3) delivery of the placenta. Stress hormones produced during labor send blood to the brain and heart, prepare the baby to breathe, and arouse the infant into alertness. The Apgar Scale is used to assess the infant's physical condition quickly after birth. In Western nations, birth alternatives include natural, or prepared, childbirth; delivery in a family-centered, homelike birth center; or home birth. Preterm and low-birth-weight infants are at risk for many problems. Providing special infant stimulation and training parents in caregiving skills can help these infants develop favorably.

Reflexes are the newborn baby's most obvious organized patterns of behavior. Throughout the day and night, newborns move in and out of five states of arousal but spend the greatest amount of time asleep. The stimulation of rapid-eye-movement

(REM) sleep is vital for growth of the central nervous system. Crying is the first way babies communicate that they need food, comfort, or stimulation. The senses of touch, taste, smell, and hearing are well-developed at birth; vision is the least-developed of the newborn's senses.

After childbirth, all family members face challenges adapting to the new family unit. When the parents' relationship is positive and cooperative, social support is available, and families have sufficient income, the stress caused by the birth of a baby remains manageable.

LEARNING OBJECTIVES

After reading this chapter, you should be able to answer the following:

3.1 List the three periods of prenatal development, and describe the major milestones of each. (pp. 61–66)

3.2 Cite factors that influence the impact of teratogens, and discuss evidence on the impact of known or suspected teratogens. (pp. 66–71)

3.3 Describe the impact of additional maternal factors on prenatal development. (pp. 71–72, 73)

3.4 Why is early and regular health care vital during the prenatal period? (pp. 73–75)

3.5 Describe the three stages of childbirth, the baby's adaptation to labor and delivery, and the newborn baby's appearance. (pp. 75–76)

3.6 Describe natural childbirth and home delivery, noting benefits and concerns associated with each. (pp. 77–78)

3.7 List common medical interventions during childbirth, circumstances that justify their use, and any dangers associated with each. (pp. 78–79)

3.8 Describe risks associated with preterm birth and low birth weight, along with effective interventions. (pp. 79–81, 82)

3.9 Describe the newborn baby's reflexes and states of arousal, noting sleep characteristics and ways to soothe a crying baby. (pp. 81, 83–86)

3.10 Describe the newborn baby's sensory capacities. (pp. 86–88)

3.11 Describe typical changes in the family after the birth of a new baby. (p. 88)

LECTURE OUTLINE

I. PRENATAL DEVELOPMENT (pp. 61–66)

- Conception usually takes place in one of the woman's two *fallopian tubes,* where sperm and ovum unite to form the zygote.
- The 38 weeks of pregnancy are usually divided into three periods: (1) the germinal period, (2) the period of the embryo, and (3) the period of the fetus.
- The germinal period lasts about two weeks, from fertilization until the cell mass attaches itself to the wall of the uterus.
- **Implantation** occurs between the seventh and ninth days, when the blastocyst burrows deep into the uterine lining.
- The trophoblast forms a membrane, the **amnion,** that encloses the developing organism in protective *amniotic fluid.*
- A *yolk sac* emerges that produces blood cells until the developing liver, spleen, and bone marrow are mature enough to take over this function.
- By the end of the second week, cells of the trophoblast form a protective membrane, the **chorion,** which surrounds the amnion.
- The **placenta,** which brings the embryo's and mother's blood close together, is connected to the developing organism by the **umbilical cord.**
- During the period of the **embryo**, from implantation through the eighth week of pregnancy, the groundwork is laid for all body structures and internal organs.
- In the last half of the first month, the embryonic disk forms three layers of cells—*ectoderm, mesoderm,* and

endoderm—which give rise to all parts of the body.
- The ectoderm folds over to form the **neural tube.** At 3½ weeks, the top of the neural tube swells to form the brain.
- During the fifth week, production of *neurons* begins. By the end of the second month, the embryo responds to touch and can move.
- During the period of the **fetus**, from the ninth week to the end of pregnancy, the organism increases rapidly in size.
- Prenatal development is sometimes divided into three equal time periods called **trimesters.**
- By the middle of the second trimester, the mother can feel the movements of the fetus.
- The fetus is covered with a white, cheeselike substance called **vernix** and with white, downy hair called **lanugo.**
- At the end of the second trimester, most of the brain's neurons are in place and begin rapidly forming *synapses*.
- The **age of viability,** between 22 and 26 weeks, is the point at which the baby can first survive if born early.
- The third trimester brings greater responsiveness to external stimulation. The fetus also receives antibodies from the mother's blood that protect against illnesses.

II. PRENATAL ENVIRONMENTAL INFLUENCES (pp. 66–75)
- A **teratogen** is any environmental agent that causes damage during the prenatal period, including drugs, tobacco, alcohol, ionizing radiation, environmental pollution, and infectious disease.
- The harm done by teratogens depends on dose, heredity, other negative influences, and the age of the organism at time of exposure.
- **Fetal alcohol spectrum disorder (FASD)** refers to the range of physical, mental, and behavioral outcomes caused by prenatal alcohol exposure, including **fetal alcohol syndrome (FAS)** (the most severe), **partial fetal alcohol syndrome (p-FAS),** and **alcohol-related neurodevelopmental disorder (ARND).**
- Exposure to ionizing radiation can cause miscarriage, brain damage, physical deformities, slow physical growth, and increased risk of later problems.
- In industrialized nations, potentially dangerous environmental pollutants include mercury, PCBs, lead, dioxins, and air pollution.
- Infectious diseases that can affect the developing organism include *rubella*, the *human immunodeficiency virus (HIV), cytomegalovirus, herpes simplex 2,* and *toxoplasmosis.*
- Prenatal malnutrition can cause serious damage to the central nervous system and can distort the structure of other vital organs, predisposing the individual to later health problems.
- When women experience severe emotional stress during pregnancy, their babies are at risk for later impaired physical and psychological well-being.
- **Rh factor incompatibility** occurs when a mother lacks the Rh blood protein and the baby inherits the Rh-positive blood type from the father. It can usually be prevented by giving a vaccine to the Rh-negative mother.
- In addition to increased risk of infertility, miscarriage, and chromosomal defects with older maternal age, birth complications rise after age 40.
- Regular medical checkups throughout pregnancy helps ensure the health of the mother and fetus.

III. CHILDBIRTH (pp. 75–76)
- The process of childbirth occurs in three stages: *dilation and effacement of the cervix, delivery of the baby,* and *delivery of the placenta*.
- Stress hormones produced by the force of the contractions help the baby withstand oxygen deprivation by sending a rich supply of blood to the brain and heart. They also prepare the baby to breathe and arouse the infant into alertness.
- The **Apgar Scale** is used to assess the infant's physical condition on the basis of five criteria: heart rate, respiratory effort, reflex irritability, muscle tone, and color.

IV. APPROACHES TO CHILDBIRTH (pp. 77–78)
- In Western nations, childbirth moved from home to hospital during the industrial revolution of the 1800s.
- By the mid-twentieth century, a natural childbirth movement arose as women questioned the routine use of medical procedures during labor and delivery.
- The techniques of **natural,** or **prepared, childbirth,** including relaxation and breathing techniques and the presence of a labor coach, are aimed at reducing pain and medical intervention and making childbirth a rewarding experience.
- Mothers who receive social support during labor and delivery less often have instrument-assisted or cesarean deliveries or need medication to control pain, and their babies have higher Apgar scores.
- Home birth is popular in certain industrialized nations but is chosen by less than 1 percent of American women.

V. MEDICAL INTERVENTIONS (pp. 78–79)

- Medical interventions during birth are justified to prevent serious complications—for example, when an infant suffers from **anoxia** or is in **breech position**—but in other cases, they can interfere with delivery and even pose new risks.
- The use of **fetal monitors** to track the baby's heart rate during labor is linked to an increase in the number of instrument and cesarean deliveries.
- In more than 80 percent of U.S. births, some form of medication is used to control pain during labor.
- Because drugs rapidly cross the placenta, exposed newborns are at risk for respiratory distress and tend to be sleepy and withdrawn, to suck poorly during feedings, and to be irritable when awake.
- Medical control over childbirth is largely responsible for the worldwide rise in **cesarean delivery,** which currently accounts for 33 percent of births in the United States.

VI. PRETERM AND LOW-BIRTH-WEIGHT INFANTS (pp. 79–81, 82)

- **Preterm infants** are born several weeks or more before their due date. Their weight may be appropriate, based on time spent in the uterus.
- **Small-for-date infants** are below their expected weight considering length of the pregnancy. They usually have more serious problems than preterm infants.
- The appearance and behavior of preterm babies can lead parents to be less sensitive in caring for them, but how well these infants develop has a great deal to do with the parent–child relationship.
- Skin-to-skin "kangaroo care" fosters improved oxygenation of the baby's body, temperature regulation, sleep, breastfeeding, alertness, and infant survival.
- When preterm infants live in stressed, economically disadvantaged households, long-term, intensive intervention is necessary to promote favorable development.
- Even the best caregiving environments cannot always overcome the biological risks associated with extreme preterm and low birth weight.
- The United States has made less progress in reducing **infant mortality** than many other countries.

VII. THE NEWBORN BABY'S CAPACITIES (pp. 81, 83–88)

- Newborn **reflexes** are inborn, automatic responses to a particular form of stimulation. Some have survival value; others help parents and infants establish gratifying interaction.
- Most newborn reflexes disappear during the first six months, due to a gradual increase in voluntary control over behavior as the cerebral cortex develops.
- Newborn infants move in and out of five **states of arousal** throughout the day and night: **rapid-eye-movement (REM) sleep, non-rapid-eye-movement (NREM) sleep,** drowsiness, quiet alertness, and waking activity and crying.
- In industrialized nations, the leading cause of infant mortality in the first year is **sudden infant death syndrome (SIDS).**
- Babies cry to communicate their physical needs and in response to other stimuli, such as a sudden noise. Crying typically peaks at about 6 weeks and then declines.
- Techniques for soothing a crying baby include lifting the baby to the shoulder and rocking or walking or swaddling the baby snugly in a blanket.
- In cultures where babies are in physical contact with their caregivers almost continuously, infants show shorter bouts of crying than American babies.
- The cries of brain-damaged babies and of those who have experienced prenatal and birth complications are often shrill, piercing, and shorter in duration than those of healthy infants.
- Sensitivity to touch and to pain is present at birth, as are preferences for several basic tastes and for certain odors such as the odor of the mother's lactating breast.
- Newborns can hear a wide variety of sounds. They prefer complex sounds to pure tones and listen longer to human speech than to nonspeech sounds.
- Vision is the least-developed sense at birth. Newborns cannot focus their eyes well and have limited **visual acuity.**

VIII. ADJUSTING TO THE NEW FAMILY UNIT (p. 88)

- In the first weeks after a baby's birth, the mother needs to recover from childbirth, adjust to hormonal changes, and establish the breastfeeding relationship. The father must become a part of this new threesome while supporting the mother in her recovery.
- When the parents' relationship is positive and cooperative, social support is available, and families have sufficient income, the stress caused by the birth of a baby remains manageable.

LECTURE ENHANCEMENTS

LECTURE ENHANCEMENT 3.1
Pollution and Infant Health: Research Findings and Policy Implications (p. 69–70)

Objective: To consider research findings on the health effects of prenatal exposure to low levels of pollution and the implications of these findings for public policy.

Currie's (2013) review of recent research on the impact of low levels of pollution is a useful supplement to the text discussion of prenatal exposure to environmental pollution (pages 69–70). As described in the text, even low levels of maternal exposure to pollutants during pregnancy may pose serious risks. For example, low-level prenatal exposure to polychlorinated biphenyls (PCBs) is linked to reduced birth weights, smaller heads, persisting attention and memory difficulties, and lower intelligence test scores in childhood. Similarly, babies with low-level exposure to lead show slightly poorer mental and motor development.

Currie focuses on studies that were specifically designed to investigate the health effects of the relatively low ambient levels of pollution typically found in wealthy countries today, as compared with the much higher levels of the past. For example, "hazardous" levels of carbon monoxide (CO), as defined by the Environmental Protection Agency, rarely occur in the developed world today. "Moderate" levels, however, are far more common, and urbanization means that more people than in the past are subjected to these lower levels of pollution. On the other hand, plant closings due to economic downturns reduce pollution in the immediate vicinity, and some studies have identified an associated decline in infant mortality in these areas.

As Currie observes, some researchers argue that pervasive low-level exposure to environmental pollution may help to account for rising rates of asthma, autism, and attention-deficit hyperactivity disorder in many rich countries. Her focus on efforts to identify causal effects of pollution, rather than simply documenting correlations, makes her work a valuable addition to class discussion of the effects of prenatal environmental pollution and of the policy implications of research findings.

Currie, J. (2013). Pollution and infant health. *Child Development Perspectives, 7,* 237–242. doi: 10.1111/cdep.12047

LECTURE ENHANCEMENT 3.2
Effects of Prenatal Stress on Mothers and Infants: Evidence from Psychoneuroimmunology (pp. 71–72)

Objective: To consider the adverse consequences of emotional stress during pregnancy on both mothers and infants, as well as the potential mitigating effects of prenatal support programs.

As described in the text (page 71), when women experience severe emotional stress during pregnancy, they and their infants are at risk for a wide variety of difficulties, including miscarriage, prematurity, low birth weight, and lasting physical and psychological impairments. In this paper, Coussons-Read (2012) reviews research in psychoneuroimmunology suggesting that prenatal stress disrupts "adaptations in the maternal immune, endocrine, and nervous systems that support healthy pregnancy." She cites evidence that prolonged stress leads to chronic activation of the body's biological "fight or flight" response systems. When this activation occurs during pregnancy, it puts the health of the developing infant as well as the mother at risk.

Coussons-Read notes that epigenetic studies indicate that mothers' experience of stressful prenatal events, such as partner abuse or poverty, has enduring physiological effects on offspring. She also cites evidence that for minority women, the experience of discrimination and prejudice may exacerbate the effects of other types of prenatal stress. She calls for research aimed at "developing interventions to reduce maternal stress [and] alleviate the maladaptive biological changes … associated with it," thereby improving birth outcomes. This paper provides a context for class discussion of the Nurse–Family Partnership, described in the Social Issues: Health box on page 73, enabling students to consider the demonstrated benefits of this prenatal social support program in light of the research findings reviewed in this paper.

Coussons-Read, M. E. (2012). The psychoneuroimmunology of stress in pregnancy. *Current Directions in Psychological Science, 21,* 323–328. doi: 10.1177/0963721412453720

LEARNING ACTIVITIES

LEARNING ACTIVITY 3.1
True or False: Prenatal Development (pp. 61–66)

Present the following exercise as an in-class activity or quiz.

Directions: Read each of the following statements and determine whether it is *True* (T) or *False* (F).

_____ 1. Fertilization usually takes place in the fallopian tube.
_____ 2. As many as 50 percent of zygotes do not survive the first two weeks.
_____ 3. During the period of the fetus, the groundwork is laid for all body structures and internal organs.
_____ 4. During the last half of the first month of pregnancy, the nervous system develops fastest.
_____ 5. In the second month of pregnancy, the eyes, ears, nose, jaw, and neck form.
_____ 6. The period of the fetus is the longest prenatal period.
_____ 7. Brain weight doubles from the twentieth week until birth.
_____ 8. The age of viability occurs sometime between 22 and 26 weeks.
_____ 9. At 28 weeks, the fetus is awake about 30 percent of the time.
_____ 10. Research indicates that more active fetuses during the third trimester become 2-year-olds who are less fearful of unfamiliar adults.

Answers:

1. T
2. F
3. F
4. T
5. T
6. T
7. F
8. T
9. F
10. T

LEARNING ACTIVITY 3.2
Discussing Birth Experiences (pp. 61–66, 75–79)

Invite students or former students who have recently given birth to come to class to discuss their experiences. If no one is available, a student may have a friend or relative who is willing to participate. If possible, invite at least two mothers who have recently given birth, along with their partners. Ask students to prepare questions in advance to ask the panel of guests. Some questions might be:

(1) How active was the fetus during your pregnancy?
(2) Did you have the baby at home or in a hospital?
(3) Who was present at the birth?
(4) Did you experience any complications during your pregnancy or delivery?

If you can recruit more than one mother, students can examine differences in birth experiences by asking questions such as these:

(1) Did you attend natural childbirth classes, and if so, were the classes helpful?
(2) How long were you in labor? If you have given birth to more than one child, what were the differences in length of each labor?
(3) Were you given any kind of medication during labor and delivery?
(4) What was the role of the father or other coach during labor and delivery?

LEARNING ACTIVITY 3.3
Examining Genetic and Environmental Vulnerability to Teratogens (pp. 66–71)

A *teratogen* is any environmental agent that causes damage during the prenatal period. However, genes influence the extent to which the developing organism is affected by teratogens. Ask students to form small groups and, in each group, generate a list of genetic and environmental factors that may contribute to the developing organism's susceptibility to the effects of teratogens. Once students have completed the activity, ask them to share some examples with the class.

LEARNING ACTIVITY 3.4
Speaking to Pregnant Women About Prenatal Environmental Influences (pp. 66–75)

Ask students to imagine that a local health department has invited them to speak to a group of newly pregnant women about prenatal environmental influences. Have the students form small groups, and then ask each group to develop a presentation focusing on one type of environmental influence—for example:

(1) A presentation on teratogens, identifying common teratogens and the risks posed by each
(2) A presentation on nutrition and exercise during pregnancy, including recommendations for healthy eating and for appropriate exercise
(3) A presentation on emotional stress during pregnancy, including common sources of stress, effects on the developing organism, and effective ways of dealing with stress

For each type of environmental influence, ask students to use research in the text to support their answers. What recommendations would you give to promote a healthy pregnancy? Use research in your text to support your answers.

LEARNING ACTIVITY 3.5
Identifying the Multiple Origins of Low Birth Weight (pp. 67–68, 79–81)

Low birth weight may be caused by physical defects that cannot be prevented. But there are also many preventable causes, including maternal drug use, smoking, and emotional stress. In addition, the risk is higher for babies born to poverty-stricken mothers, who are more likely to be under stress, undernourished, and exposed to other harmful environmental influences.

Ask students to form small groups and, in each group, to list factors that increase the chances that a baby will be born underweight. Which of the factors cited can be prevented by providing better health care for mothers and babies? What interventions are available to babies who are born underweight?

LEARNING ACTIVITY 3.6
Matching Infant States of Arousal (pp. 83–86)

Present the following exercise as an in-class activity or quiz.
Directions: Match each infant state of arousal with its description.

_____ 1. Drowsiness
_____ 2. Waking activity and crying
_____ 3. Irregular, or REM, sleep
_____ 4. Regular, or NREM, sleep
_____ 5. Quiet alertness

Function:

A. Body is relatively inactive, with eyes open and attentive. Breathing is even.
B. Frequent bursts of uncoordinated body activity; irregular breathing. Crying may occur.
C. Full rest; little or no body activity. Eyelids are closed, face is relaxed, and breathing is slow and regular.
D. Eyes open and close; when open, they have a glazed look.
E. Gentle limb movements, occasional stirring, and facial grimacing. Breathing is irregular.

Answers:

1. D
2. B
3. E
4. C
5. A

LEARNING ACTIVITY 3.7
Applying Ecological Systems Theory to the Transition to Parenthood (p. 88)

As described in the text, the early weeks after the arrival of a new baby can be challenging. During this time, a number of factors, including hormonal changes, the parents' relationship, and the availability of social support, influence the transition to parenthood.

Ask students to review ecological systems theory on pages 19–21 of Chapter 1. Next, ask them to describe factors at each level of the environment that may influence the transition to parenthood. Encourage students to consider bidirectional influences, the role of third parties, and the impact of macrosystem factors such as workplace benefits for employed parents or the availability of affordable child care. Once students have completed the activity, ask them to share some examples with the class.

ASK YOURSELF . . .

CONNECT: How is brain development related to fetal capacities and behavior? What implications do individual differences in fetal behavior have for infant temperament after birth? (pp. 64–65)

During the fifth week of pregnancy, production of *neurons* begins deep inside the neural tube at the astounding pace of more than 250,000 per minute. Once formed, neurons begin traveling along tiny threads to their permanent locations, where they will form the major parts of the brain. By the end of this period, the embryo can already sense its world. It responds to touch, particularly in the mouth area and on the soles of the feet. And it can move, although its tiny flutters are still too light to be felt by the mother.

By the end of the second trimester, most of the brain's billions of neurons are in place. However, *glial cells,* which support and feed the neurons, increase rapidly throughout the remaining months of pregnancy, as well as after birth. Consequently, brain weight increases tenfold from the twentieth week until birth. At the same time, neurons begin forming *synapses,* or connections, at a rapid pace. Brain growth means new sensory and behavioral capacities. The 20-week-old fetus can be stimulated as well as irritated by sounds. If a doctor looks inside the uterus using fetoscopy, fetuses try to shield their eyes from the light with their hands, indicating that sight has begun to emerge.

During the final trimester, the *cerebral cortex,* the seat of human intelligence, enlarges. As rapid gains in neural connectivity and organization continue, the fetus spends more time awake—about 11 percent of the time at 28 weeks, a figure that rises to 16 percent just before birth. Between 30 and 34 weeks, fetuses show rhythmic alternations between sleep and wakefulness that gradually increase in organization.

The fetus also shows signs of developing temperament. In one study, more active fetuses during the third trimester became 1-year-olds who could better handle frustration and 2-year-olds who were more active as well as less fearful of unfamiliar adults and situations. Fetal activity may be an indicator of healthy neurological development, which fosters adaptability in childhood.

APPLY: Amy, two months pregnant, wonders how the embryo is being fed and what parts of the body have formed. "I don't look pregnant yet, so does that mean not much development has taken place?" she asks. How would you respond to Amy? (pp. 63–64, 66)

By the end of the second week, tiny fingerlike villi, or blood vessels, emerge from a protective membrane called the chorion. As these villi burrow into the uterine wall, the placenta starts to develop. By bringing the embryo's and mother's blood close together, the placenta permits food and oxygen to reach the developing organism and waste products to be carried away. The placenta is connected to the developing organism by the umbilical cord, which contains one large vein that delivers blood loaded with nutrients and two arteries that remove waste products.

During the period of the embryo, from the second through the eighth week of pregnancy, the groundwork is laid for all body structures and internal organs. In the second month, the eyes, ears, nose, jaw, neck, arms, legs, fingers, and toes form. Internal organs become more distinct: The intestines grow, the heart develops separate chambers, and the liver and spleen take over production of blood cells. Even though Amy does not yet look pregnant, this is the period when serious defects are most likely to occur because the foundations for all body parts are being laid down.

CONNECT: Using what you learned about research strategies in Chapter 1, explain why it is difficult to determine the prenatal effects of many environmental agents, such as drugs and pollution. (p. 66)

It is difficult to determine the effects of many environmental agents on the developing organism because the harm done by teratogens is not always straightforward. It depends on several factors, including dose, heredity, other negative influences, and age. For example, larger doses over longer time periods usually have more negative effects. The genetic makeup of the mother and the developing organism also plays an important role, because some individuals are better able than others to withstand harmful environments. The presence of several negative factors at once, such as additional teratogens, poor nutrition, and lack of medical care, can worsen the impact of a harmful agent. Moreover, the effects of teratogens vary with the age of the organism at time of exposure. Therefore, researchers investigating the prenatal effects of teratogens must design their studies carefully to control for the interactions of all of these factors.

APPLY: Nora, pregnant for the first time, believes that a few cigarettes and a glass of wine a day won't be harmful. Provide Nora with research-based reasons for not smoking or drinking. (pp. 68–69)

Nora should be told that both smoking and drinking alcohol can be harmful to the developing organism. Smoking harms the fetus in several ways. Nicotine, the addictive substance in tobacco, constricts blood vessels, lessens blood flow to the uterus, and causes the placenta to grow abnormally. This reduces the transfer of nutrients, so the fetus gains weight poorly.

Also, nicotine raises the concentration of carbon monoxide in the bloodstreams of both mother and fetus. Carbon monoxide displaces oxygen from red blood cells, damaging the central nervous system and slowing fetal body growth. Other toxic chemicals in tobacco, such as cyanide and cadmium, contribute to its damaging effects.

The best-known effect of smoking during the prenatal period is low birth weight; other serious risks include miscarriage, prematurity, cleft lip and palate, blood vessel abnormalities, impaired heart rate and breathing during sleep, infant death, and asthma and cancer later in childhood. Newborns of smoking mothers are less attentive to sounds, display more muscle tension, are more excitable when touched and visually stimulated, and more often have colic (persistent crying). These findings suggest subtle negative effects on brain development. Consistent with this view, prenatally exposed children and adolescents have shorter attention spans, difficulties with impulsivity and overactivity, poorer memories, lower intelligence and achievement test scores, and higher levels of disruptive, aggressive behavior.

Prenatal maternal drinking is linked to fetal alcohol spectrum disorder (FASD), which encompasses a range of physical, mental, and behavioral outcomes, including fetal alcohol syndrome (FAS), partial fetal alcohol syndrome (p-FAS), and a less severe form known as alcohol-related neurodevelopmental disorder (ARND). The more alcohol a pregnant woman consumes, the poorer the child's motor coordination, speed of information processing, reasoning, and intelligence and achievement test scores during the preschool and school years. In adolescence and early adulthood, FASD is associated with persisting attention and motor-coordination deficits, trouble with the law, inappropriate social and sexual behaviors, alcohol and drug abuse, and lasting mental health problems, including depression and high emotional reactivity to stress. Even mild drinking, less than one drink per day, is associated with reduced head size (a measure of brain development), slow body growth, and behavior problems. Because of these risks, Nora should avoid tobacco and alcohol altogether.

REFLECT: If you had to choose five environmental influences to publicize in a campaign aimed at promoting healthy prenatal development, which ones would you choose, and why? (pp. 66–71)

This is an open-ended question with no right or wrong answer.

CONNECT: How might natural childbirth positively affect the parent–newborn relationship? Explain how your answer illustrates bidirectional influences between parent and child, emphasized in ecological systems theory. (pp. 77–78)

Natural childbirth makes use of techniques aimed at reducing pain and medical intervention, which may make it possible to avoid or limit the use of pain-relieving drugs during childbirth. Because the drugs used in epidural analgesia rapidly cross the placenta, exposed newborns are at risk for respiratory distress and tend to be sleepy and withdrawn, to suck poorly during feedings, and to be irritable when awake. These behaviors can lead parents to be less sensitive and responsive in caring for the baby, which, in turn, leads to more of the same behavior in the infant—an example of bidirectional influences between parent and child, as emphasized in ecological systems theory.

Natural childbirth also emphasizes the value of social support during labor and delivery. Mothers who receive such support less often have instrument-assisted or cesarean deliveries or need medication to control pain. Their babies' Apgar scores are higher, and they are more likely to be breastfeeding at a two-month follow-up. Because their babies are alert and responsive, these mothers are, in turn, likely to respond sensitively to them—again, an example of bidirectional influences.

APPLY: Sharon, a heavy smoker, has just arrived at the hospital in labor. Which medical intervention discussed in the preceding sections is her doctor justified in using? (For help in answering this question, review the prenatal effects of tobacco on page 68.) (p. 78)

Research has established that maternal smoking results in low birth weight and increases the risk of miscarriage, prematurity, and infant death, among other serious consequences. Consequently, Sharon's doctor would be justified in using a *fetal monitor,* an electronic instrument that tracks the baby's heart rate during labor. An abnormal heartbeat pattern may indicate that the baby is in distress due to anoxia and needs to be delivered immediately. Fetal monitoring is a safe medical procedure that has saved the lives of many babies in high-risk situations.

REFLECT: If you were an expectant parent, would you choose home birth? Why or why not? (pp. 77–78)

This is an open-ended question with no right or wrong answer.

CONNECT: List factors discussed in this chapter that increase the chances that an infant will be born underweight. How many of these factors could be prevented by better health care for expectant mothers? (pp. 66–74, 79–81)

Low-birth-weight newborns include both *preterm infants,* born several weeks or more before their due date, whose weight may still be appropriate based on time spent in the uterus, and *small-for-date infants*, who are below their expected weight considering the length of the pregnancy. Small-for-date infants, especially those who are also preterm, usually have more

serious problems. These infants probably experienced inadequate nutrition before birth. Perhaps their mothers did not eat properly, the placenta did not function normally, or the babies themselves had defects that prevented them from growing as they should.

Infants are more likely to be born underweight when the mother is exposed to harmful environmental influences (teratogens), is malnourished, is under severe emotional stress, or does not receive adequate prenatal care. Teratogens that may cause low birth weight include prescription and nonprescription drugs, illegal drugs such as cocaine or heroin, tobacco, alcohol, caffeine, ionizing radiation, environmental pollutants, and certain infectious diseases.

Better health care for expectant mothers can ensure that women know about proper nutrition and have adequate food as well as vitamin–mineral enrichment. Social support can help prevent severe emotional stress, which is especially common in economically disadvantaged women. Finally, expectant mothers can be educated about the damage done by common teratogens, such as alcohol and tobacco.

APPLY: Cecilia and Anna each gave birth to a 3-pound baby seven weeks preterm. Cecilia is single and on welfare. Anna and her partner are happily married and earn a good income. Plan an intervention appropriate for helping each baby develop. (pp. 80–81)

Skin-to-skin "kangaroo care," in which the infant is placed in a vertical position between the mother's breasts or next to the father's chest (under the parent's clothing) would be an appropriate intervention for both Cecilia and Anna. Kangaroo skin-to-skin contact, in which the parent's body functions as a human incubator, fosters improved oxygenation of the baby's body, temperature regulation, sleep, breastfeeding, alertness, and infant survival. Parents practicing kangaroo care feel more confident about caring for their fragile babies, interact more sensitively and affectionately, and feel more attached to them.

Because of Cecilia's difficult situation, she and her baby might also benefit from long-term, intensive intervention, including medical follow-ups, weekly parent training sessions, and cognitively stimulating child care for her baby.

Because of their economic status, Anna and her partner's baby may be more likely to remain in the hospital until the infant is in stable condition. During the hospital stay, their baby should receive special stimulation, which has been linked to faster weight gain, more predictable sleep patterns, and greater alertness in preterm infants. This intervention might include rocking in a suspended hammock, being massaged several times a day, and being exposed to other forms of stimulation—for example, listening to recordings of soft music or to a recording of their mother's voice and heartbeat. When they are ready to bring the baby home, Anna and her partner would benefit from a few sessions of coaching in recognizing and responding to their baby's needs.

REFLECT: Many people object to the use of extraordinary medical measures to save extremely low-birth-weight babies because of their high risk for serious developmental problems. Do you agree or disagree? Explain. (pp. 80–81)

This is an open-ended question with no right or wrong answer.

CONNECT: How do the diverse capacities of newborn babies contribute to their first social relationships? Provide as many examples as you can. (pp. 81, 83–88)

Newborn reflexes: Reflexes are the newborn baby's most obvious organized patterns of behavior. Several reflexes help parents and infants establish gratifying interaction. A baby who successfully finds the nipple, sucks easily during feedings, and grasps when the hand is touched encourages parents to respond lovingly and feel competent as caregivers. Reflexes can also help caregivers comfort the baby. For example, sucking on a pacifier may help quiet a fussy baby until the caregiver can feed, change, or hold him.

States of arousal: Throughout the day and night, newborn infants move in and out of five states of arousal, or degrees of sleep and wakefulness. Striking individual differences in these daily rhythms affect parents' attitudes toward and interactions with the baby. A few newborns sleep for long periods, increasing the energy their well-rested parents have for sensitive, responsive care. Other babies cry a great deal, and their parents must exert great effort to soothe them. If these parents do not succeed, they may feel less competent and less positive toward their infant. Further, babies who spend more time alert probably receive more social stimulation and opportunities to explore and, therefore, may have a slightly advantage in cognitive development.

Crying: Crying is the first way that babies communicate, letting parents know they need food, comfort, or stimulation. A baby's cry stimulates a sharp rise in blood cortisol, alertness, and feelings of discomfort in men and women, parents and nonparents alike. This powerful response is probably innately programmed to ensure that babies receive the care they need to survive.

Sensory capacities: The baby is born with sensory capacities that evoke interaction with caregivers, laying the foundation for first social relationships. Touch, which is well-developed at birth, helps stimulate early physical growth and is also vital for

emotional development. Taste and smell are also well-developed. Newborns can distinguish several basic tastes, and, at 2 to 4 days of age, breastfed babies prefer the odors of their own mother's breast and underarm to those of an unfamiliar lactating mother. Both breast- and bottle-fed 3- to 4-day-olds find the odor of human milk more attractive than the smell of formula milk. Newborns' dual attraction to the odors of their mother and of breast milk helps them locate an appropriate food source and also begin to distinguish their caregiver from other people. Newborns listen longer to human speech than to structurally similar nonspeech sounds, and they make fine-grained distinctions among many speech sounds. Finally, although newborns have only limited visual acuity, they actively explore their visual world by scanning it for interesting sights and tracking moving objects.

REFLECT: Are newborns more competent than you thought they were before you read this chapter? Which of their capacities most surprised you? (pp. 81, 83–88)

This is an open-ended question with no right or wrong answer.

MEDIA MATERIALS

For details on individual video segments that accompany the DVD for *Exploring Lifespan Development,* Fourth Edition, please see the DVD Guide for *Explorations in Lifespan Development.* The DVD and DVD Guide are available through your Pearson sales representative.

Additional DVDs and streaming videos that may be useful in your class are listed below. They are not available through your Pearson sales representative, but you can order them directly from the distributors. (See contact information at the end of this manual.)

Beginnings of Life: From Conception to Baby (2011, Magna Systems/Learning Seed, 31 min.). Overview of the stages of fetal development, emphasizing the importance of prenatal care, nutrition, and a healthy prenatal environment.

Doula! The Ultimate Birth Companion (2010, Films Media Group, 60 min.). An intimate look at the work of doulas.

Fetal Alcohol Exposure: Changing the Future (2006, Films for the Humanities & Sciences, 31 min.). Neurological, cognitive, and behavioral effects of prenatal alcohol exposure.

Human Reproduction and Childbirth (2009, Insight Media, 20 min.). Biological functions of the male and female reproductive systems, including the stages of prenatal development and a description of the birth process.

Making Mothers (2009, Fanlight Productions/Ben Crosbie and Tessa Moran, 20 min.). Profile of the Family Health and Birth Center in Washington, D.C., which serves the area's primarily African-American community.

Midwives: A Global Perspective on Childbirth (2010, Films Media Group, 60 min.). How culture, law, and religion influence pregnancy and childbirth.

The Nine Months That Made You: Pregnancy and Human Development (2011, Films Media Group/BBC, 52 min.). Overview of research suggesting links between prenatal development and later disease risks and behavioral traits.

Preventing Preterm Birth (2011, Films Media Group/Information Television Network, 24 min.). Ways to reduce the risk of preterm birth.

Understanding Fetal Alcohol Syndrome (2009, Insight Media, 13 min.). How the mother's alcohol consumption can damage the developing fetus.