CHAPTER 2: The Biology of Development

MULTIPLE CHOICE

1. _____ refers to a phenomenon in which the fetus is sometimes able to slow down the rate of growth when it senses environmental stresses and drops in nutrition.
   a. Conservation hypothesis
   b. Parsimonious genotype hypothesis
   c. Sparing nutrient hypothesis
   d. Thrifty phenotype hypothesis

   ANS: D DIF: Medium REF: Introductory Material
   TOP: Learning Objective 1 MSC: Understanding

2. All of the following act as teratogens EXCEPT:
   a. environmental toxins
   b. infectious diseases
   c. maternal exercise
   d. prescription drugs

   ANS: C DIF: Medium
   REF: Adverse Influences on the Developing Embryo and Fetus
   TOP: Learning Objective 1 MSC: Understanding

3. Researchers fed male mice either a normal diet or a low-protein diet. Mice on either diet were then mated with females raised on a normal diet. What should the researchers expect to find about the resulting offspring?
   a. Offspring of males fed the normal diet will demonstrate a marked increase in activation of genes involved in cholesterol synthesis.
   b. Offspring of males fed the low protein diet will not demonstrate a marked increase in activation of genes involved in cholesterol synthesis because their mothers were fed normal diets.
   c. Offspring of males fed the low protein diet will demonstrate a marked increase in activation levels of genes involved in cholesterol synthesis as a result of paternal diet.
   d. The offspring's diet alone, and not parental diet, influences activation levels of genes involved in cholesterol synthesis.

   ANS: C DIF: Difficult REF: Constraints on Development
   TOP: Learning Objective 1 MSC: Understanding

4. Brush turkeys are born on the ground and need to fend for themselves soon after birth, whereas songbirds are born in nests and trees and are protected. These different local environments are referred to as:
   a. biological addresses
   b. differential nests
   c. environmental niches
   d. localized adaptations

   ANS: C DIF: Easy REF: Inputs to the Biological System
   TOP: Learning Objective 1 MSC: Applying

5. Matilda was born in 1960. Her mother took the drug thalidomide while pregnant, which adversely affected Matilda's limb growth. Thalidomide is an example of a(n):
   a. homeobox
   b. illegal drug
   c. teratogen
   d. trigger substance

   ANS: C DIF: Easy
   REF: Adverse Influences on the Developing Embryo and Fetus
   TOP: Learning Objective 1 MSC: Applying

6. While pregnant, Juana is exposed to a teratogen known to affect the heart of the developing organism. The effects will likely be most severe if the exposure occurred during the:
   a. period of the zygote
   b. embryonic period
   c. fetal period
   d. third trimester

   ANS: B DIF: Medium
   REF: Adverse Influences on the Developing Embryo and Fetus
   TOP: Learning Objective 1 MSC: Applying

7. Janine is a violinist. Her brain differs in certain ways from a nonmusician; she has increased cortical representation of the fingers of the left hand. This is an example of:
   a. compensation plasticity
   b. experience-dependent plasticity
   c. learned plasticity
   d. musical plasticity

   ANS: B DIF: Medium REF: Experience and Brain Development
   TOP: Learning Objective 1 MSC: Applying

8. Margaret consumes a large amount of alcohol throughout her pregnancy. Her son is born with fetal alcohol syndrome. All of the following are associated with this condition EXCEPT:
   a. large head
   b. missing ridges under the nose
   c. thin upper lip
   d. widely spaced eyes

   ANS: A DIF: Difficult
   REF: Adverse Influences on the Developing Embryo and Fetus
   TOP: Learning Objective 1 MSC: Applying

9. Lucian grew up in a Romanian orphanage under conditions of severe deprivation. All of the following statements are true of extremely deprived children such as Lucien compared to typically developing children EXCEPT:
   a. smaller overall brain size
   b. less myelination
   c. reduced pruning
   d. reduced physiological activity

   ANS: C DIF: Difficult REF: Experience and Brain Development
   TOP: Learning Objective 1 MSC: Applying

10. What does a heritability of .9 for height mean?
    a. Ninety percent of a specific person's height is caused by her genes.
    b. Ninety percent of a specific person's height is caused by her environment.
    c. Ninety percent of a specific person's height is caused by the interaction of her genes and environment.
    d. The differences in height across the whole population are 90 percent attributable to genetic variations between that population's members.

    ANS: D DIF: Difficult REF: Heritability TOP: Learning Objective 1
    MSC: Applying

11. Which of the following is not one of the chemical bases of DNA?
    a. adenine
    b. guanine
    c. meyline
    d. thymine

    ANS: C DIF: Easy REF: Inputs to the Biological System
    TOP: Learning Objective 2 MSC: Remembering

12. Molecular biologists refer to the sequence of bases that make up genes as having two main parts. The _____ sequence directs the assembly of particular proteins.
    a. functional
    c. regulatory

b. amino acid
d. structural

ANS: D DIF: Easy REF: Inputs to the Biological System
TOP: Learning Objective 2 MSC: Remembering

13. In most organisms, the long DNA molecules are stored in the cell nucleus as tightly wound, highly compact:
a. alleles
b. chromosomes
c. genes
d. lysosomes

ANS: B DIF: Easy REF: Inputs to the Biological System
TOP: Learning Objective 2 MSC: Understanding

14. All of the following are true of genes EXCEPT:
a. genes are the inherited instructions for producing the proteins that make up cells
b. genes are the inherited instructions for regulating whether other genes will be turned on or off
c. the genetic material of animals may differ in fundamental structure
d. a gene is made up of a section of DNA

ANS: C DIF: Medium REF: Inputs to the Biological System
TOP: Learning Objective 2 MSC: Understanding

15. Which is a possible base pair?
a. adenine and cytosine
b. adenine and thymine
c. thymine and cytosine
d. thymine and guanine

ANS: B DIF: Medium REF: Inputs to the Biological System
TOP: Learning Objective 2 MSC: Understanding

16. _____ refers to the ways that the genetic information is expressed or manifested in an organism, including its anatomical structures and behaviors.
a. Autosomy
b. Genotype
c. Phenotype
d. Zygosity

ANS: C DIF: Easy REF: Inputs to the Biological System
TOP: Learning Objective 3 MSC: Remembering

17. _____ are ordered clusters of genes that turn on and off genes that affect the general body plan in many species.
a. Activator genes
b. Homeobox genes
c. Homologs
d. Suppressor genes

ANS: B DIF: Easy REF: Diversity out of Uniformity
TOP: Learning Objective 3 MSC: Remembering

18. Which of the following statements is true?
a. A particular allele's unique characteristics may only be expressed in certain contexts.
b. Differences never arise between the genotype of an organism and its phenotype.
c. Genotype is the sole determinant of phenotype.
d. Genes have the same effects regardless of environmental conditions.

ANS: A DIF: Difficult REF: Inputs to the Biological System
TOP: Learning Objective 3 MSC: Understanding

19. The picture below illustrates:

a. chain reactions
b. genetic ripples
c. a landscape of canalization
d. regulatory cascades

ANS: D DIF: Easy REF: Inputs to the Biological System
TOP: Learning Objective 3 MSC: Applying

20. Several genes influence human skin color. This is an example of:
a. heterozygous inheritance
b. homeobox inheritance
c. pleiotropic inheritance
d. polygenic inheritance

ANS: D DIF: Easy REF: Behavioral Genomics
TOP: Learning Objective 3 MSC: Applying

21. Jerome receives the allele for facial dimples from both his mother and father. Jerome is said to be _____ for facial dimples.
a. codominant
b. dizygotic
c. heterozygous
d. homozygous

ANS: D DIF: Medium REF: Inputs to the Biological System
TOP: Learning Objective 3 MSC: Applying

22. Lucinda inherits one allele for type A blood and one allele for type O blood. She would have type A blood because the allele for type A is:
a. codominant
b. dominant
c. heterozygous
d. recessive

ANS: B DIF: Medium REF: Inputs to the Biological System
TOP: Learning Objective 3 MSC: Applying

23. Stanley inherits one allele for normally pigmented skin and one allele for albinism. Stanley would not display albinism because the allele for albinism is:
a. codominant
b. dominant
c. recessive
d. submissive

ANS: C DIF: Medium REF: Inputs to the Biological System
TOP: Learning Objective 3 MSC: Applying

24. Ehrendiera inherits one allele for type A blood and one allele for type B blood. She has type AB blood. This is an example of:
a. codominance
b. heterozygosity
c. joint alleles
d. polygenic inheritance

ANS: A DIF: Medium REF: Inputs to the Biological System
TOP: Learning Objective 3 MSC: Applying

25. Phenylketonuria is a genetic disorder, which is caused by a defect in the single gene. There are numerous effects of this disorder including mental retardation, eczema, and pigment abnormalities. That one gene affects many traits is an example of:
a. heterozygous genes
b. homeobox genes
c. pleiotropic genes
d. polygenic genes

ANS: C DIF: Medium REF: Behavioral Genomics

TOP: Learning Objective 3 MSC: Applying

26. Waddington described changing cells undergoing a process of _____ through which they get committed to becoming certain types.
    a. canalization
    b. commitment
    c. methylation
    d. myelination

    ANS: A DIF: Easy REF: Constraints on Development
    TOP: Learning Objective 4 MSC: Remembering

27. _____ lead(s) to changes in gene expression without changes to DNA sequences.
    a. Epigenetic regulation
    b. Feedback loops
    c. Genetic parameterization
    d. Regulatory cascades

    ANS: A DIF: Easy REF: Constraints on Development
    TOP: Learning Objective 4 MSC: Remembering

28. _____ control the timing of major anatomical developments.
    a. Chronometric genes
    b. Heterochronic genes
    c. Horological genes
    d. Temporal genes

    ANS: B DIF: Easy REF: Constraints on Development
    TOP: Learning Objective 4 MSC: Remembering

29. The textbook categorizes all of the following as key constraints shaping development EXCEPT:
    a. the differentiation of cell types and anatomical structures
    b. the integration of cell types and anatomical structures
    c. the continuous need for viability of the developing organism
    d. the timing of when genes are switched on or off to produce developing cells and structures in particular sequences

    ANS: B DIF: Easy REF: Constraints on Development
    TOP: Learning Objective 4 MSC: Understanding

30. _____ refers to the unique process of cell division that produces the egg and sperm cells.
    a. DNA replication
    b. Gametization
    c. Meiosis
    d. Mitosis

    ANS: C DIF: Easy REF: Meiosis and Fertilization
    TOP: Learning Objective 5 MSC: Remembering

31. Demetrius has an extra X chromosome. His condition is referred to as:
    a. Klinefelter syndrome
    b. monosomy X
    c. Turner syndrome
    d. XYY syndrome

    ANS: A DIF: Medium REF: Meiosis and Fertilization
    TOP: Learning Objective 5 MSC: Remembering

32. Which of the following statements is FALSE regarding sperm cells?
    a. Sperm cells are also known as gametes.
    b. Sperm cells are produced by mitosis.
    c. Sperm cells have only one of each type of chromosome.
    d. Sperm cells provide half of the genetic material during fertilization.

    ANS: B DIF: Medium REF: Meiosis and Fertilization
    TOP: Learning Objective 5 MSC: Understanding

33. A researcher is examining skin cells. These cells were created through the process of:
    a. crossing-over
    b. gastrulation
    c. meiosis
    d. mitosis

    ANS: D DIF: Difficult REF: Meiosis and Fertilization
    TOP: Learning Objective 5 MSC: Applying

34. Down syndrome is most likely the result of which genetic condition?
    a. monosomy 13
    b. monosomy 21
    c. trisomy 21
    d. X linked inheritance

    ANS: C DIF: Difficult REF: Meiosis and Fertilization
    TOP: Learning Objective 5 MSC: Applying

35. Alicia has Turner syndrome. Which of the following traits/conditions would Alicia be UNLIKELY to exhibit?
    a. infertility
    b. missing female sex characteristics
    c. tall stature
    d. drooping eyelids

    ANS: C DIF: Difficult REF: Meiosis and Fertilization
    TOP: Learning Objective 5 MSC: Applying

36. Immediately following conception, the fertilized egg is known as the:
    a. blastocyst
    b. embryo
    c. gamete
    d. zygote

    ANS: D DIF: Easy REF: Meiosis and Fertilization
    TOP: Learning Objective 6 MSC: Remembering

37. The period of the embryo begins at about _____ after conception.
    a. 30 hours
    b. 9 weeks
    c. 2 weeks
    d. 3 months

    ANS: C DIF: Easy REF: Structures and Systems in the Embryo and Fetus
    TOP: Learning Objective 6 MSC: Remembering

38. During which period of prenatal development does the heart begin to beat?
    a. the period of the zygote
    b. the period of the embryo
    c. the second trimester
    d. the third trimester

    ANS: B DIF: Easy REF: Structures and Systems in the Embryo and Fetus
    TOP: Learning Objective 6 MSC: Remembering

39. When during prenatal development does a primitive brain appear?
    a. at conception
    b. around 2 weeks
    c. around 4 weeks
    d. around 9 weeks

    ANS: C DIF: Easy REF: Structures and Systems in the Embryo and Fetus
    TOP: Learning Objective 6 MSC: Remembering

40. From the ninth week until birth, the growing human organism is referred to as a(n):
    a. embryo
    b. fetus
    c. neonate
    d. zygote

    ANS: B DIF: Easy REF: Structures and Systems in the Embryo and Fetus

TOP: Learning Objective 6 MSC: Remembering

41. The blastocyst's middle cell layer, the mesoderm, will eventually form all of the following EXCEPT the:
    a. nervous system
    b. skeleton
    c. internal organs
    d. muscles

    ANS: A DIF: Medium REF: The First Patterns of Differentiation
    TOP: Learning Objective 6 MSC: Remembering

42. Which of the following is FALSE regarding risk factors for preterm births?
    a. Several forms of physical stress can increase the likelihood of a preterm birth.
    b. Several forms of psychological stress can increase the likelihood of a preterm birth.
    c. Only infections close to the uterus, and not infections far removed from the uterus (for example, dental infections) can increase the likelihood of a preterm birth.
    d. Smoking during pregnancy can increase the likelihood of a preterm birth.

    ANS: C DIF: Medium REF: Preterm Births
    TOP: Learning Objective 6 MSC: Understanding

43. Which of the following is FALSE regarding premature infants?
    a. Preterm birth is associated with a greater risk of a number of irregularities in brain development.
    b. Preterm birth is associated with a range of cognitive difficulties.
    c. The more immature the preterm infant is at birth, the higher the risk of medical problems just in infancy but not in childhood and beyond.
    d. Even with advances in medical technologies, preterm birth is still a cause of concern for parents, physicians, and psychologists.

    ANS: C DIF: Difficult REF: Preterm Births
    TOP: Learning Objective 6 MSC: Understanding

44. Some unspecialized cells develop into brain cells before birth. This is an example of _____ development.
    a. antenatal
    b. natal
    c. prenatal
    d. postnatal

    ANS: C DIF: Easy REF: Introductory Material
    TOP: Learning Objective 6 MSC: Applying

45. Allen and Harold are twins with nearly identical genotypes. These brothers can be described as _____ twins.
    a. conjoined
    b. monozygotic
    c. dizygotic
    d. fraternal

    ANS: B DIF: Easy REF: Meiosis and Fertilization
    TOP: Learning Objective 6 MSC: Applying

46. Having a right and left kidney, right and left ear, and right and left arm are all examples of:
    a. unilateral symmetry
    b. bilateral symmetry
    c. unilateral proportionality
    d. bilateral proportionality

    ANS: B DIF: Medium REF: The First Patterns of Differentiation
    TOP: Learning Objective 6 MSC: Applying

47. As an infant, Macie develops arm control before leg control. This is an example of:

a. antedistal development
b. bilateral development
c. cephalocaudal development
d. proximodistal development

ANS: C DIF: Medium REF: Structures and Systems in the Embryo and Fetus
TOP: Learning Objective 6 MSC: Applying

48. Certain cells might first differentiate into three general groups: cells that can form muscles, organs, or bones. At first the cells in the muscle group can become any kind of muscle but later they specialize to form particular parts of specific muscles. This illustrates:
a. cellular narrowing
b. neurulation
c. plasticity
d. successive differentiation

ANS: D DIF: Medium REF: Structures and Systems in the Embryo and Fetus
TOP: Learning Objective 6 MSC: Applying

49. In the human embryo, structures vaguely resembling gills emerge early but transform into facial muscles, middle ear bones, and other structures. This seems to support which hypothesis?
a. ontogeny recapitulates phylogeny
b. phylogeny recapitulates ontogeny
c. cephalocaudal development recapitulates proximodistal development
d. proximodistal development recapitulates cephalocaudal development

ANS: A DIF: Medium
REF: Why Does Anatomical Development Progress As It Does?
TOP: Learning Objective 6 MSC: Applying

50. The cerebrum includes all of the following EXCEPT:
a. basal ganglia
b. cerebral cortex
c. cerebellum
d. olfactory bulb

ANS: C DIF: Easy REF: Major Changes to Brain Structures
TOP: Learning Objective 7 MSC: Remembering

51. Which lobe of the brain is involved in processing and interpreting touch sensations and integrating visual and spatial information?
a. frontal lobe
b. occipital lobe
c. parietal lobe
d. temporal lobe

ANS: C DIF: Easy REF: Major Changes to Brain Structures
TOP: Learning Objective 7 MSC: Remembering

52. _____ are the gaps between the axon terminals of one neuron and the dendrites of another.
a. Glial gaps
b. Growth cones
c. Nodes of Ranvier
d. Synapses

ANS: D DIF: Easy REF: Neurons and Neurotransmitters
TOP: Learning Objective 7 MSC: Remembering

53. _____ is a fatty substance that coats the axon and speeds message transfer.
a. Axtol
b. Glial
c. Myelin
d. Neural tubing

ANS: C DIF: Easy REF: Neurons and Neurotransmitters
TOP: Learning Objective 7 MSC: Remembering

54. Heavily myelinated bundles of axons in the brain are called:

a. glial cells
b. black matter
c. gray matter
d. white matter

ANS: D DIF: Easy REF: Development of Neurons
TOP: Learning Objective 7 MSC: Remembering

55. The brainstem is concerned with all of the following EXCEPT:
a. breathing
b. coordination of voluntary movement
c. heart rate
d. swallowing

ANS: B DIF: Medium REF: Major Changes to Brain Structures
TOP: Learning Objective 7 MSC: Remembering

56. William is a veteran who has experienced a traumatic brain injury. This injury has affected his language, organizational capacity, and regulation of emotion. Which region of the brain is most likely affected by the injury?
a. frontal lobe
b. occipital lobe
c. parietal lobe
d. temporal lobe

ANS: A DIF: Medium REF: Major Changes to Brain Structures
TOP: Learning Objective 7 MSC: Remembering

57. Which brain structure is likely to be the last to develop?
a. basal ganglia
b. medulla
c. prefrontal cortex
d. somatosensory cortex

ANS: C DIF: Medium REF: Brain Development
TOP: Learning Objective 7 MSC: Understanding

58. Which of the following statements is FALSE regarding communication between neurons?
a. Neurons send messages to one another by releasing neurotransmitters from the dendrites.
b. Communication between neurons occurs at synapses.
c. There are several types of neurotransmitters, and each neuron's receptors respond to particular types.
d. Chemical signals can cause the receiving neuron to "fire," creating an electrical signal called an action potential.

ANS: A DIF: Medium REF: Neurons and Neurotransmitters
TOP: Learning Objective 7 MSC: Understanding

59. Neural structures can be pruned through programmed cell death, or:
a. apoptosis
b. myelination
c. synaptogenesis
d. synaptic pruning

ANS: A DIF: Easy REF: Development of Neurons
TOP: Learning Objective 8 MSC: Remembering

60. All of the following are main processes involved in the development of neurons EXCEPT:
a. action potentiation
b. consolidation
c. migration
d. myelination

ANS: A DIF: Easy REF: Development of Neurons
TOP: Learning Objective 8 MSC: Understanding

61. Which of the following statements is true of neurogenesis?
a. Neurogenesis only occurs prenatally.

b. Neurogenesis only occurs postnatally.
c. The same numbers of neurons are produced before and after birth.
d. Fewer neurons are produced after birth than during the prenatal period.

ANS: D DIF: Medium REF: Development of Neurons
TOP: Learning Objective 8 MSC: Understanding

62. Which of the following statements is FALSE regarding synaptic pruning?
a. Synaptic pruning only follows apoptosis.
b. Synaptic pruning seems to extend into adolescence and early adulthood.
c. Genetic factors influence the process of synaptic pruning.
d. Environmental factors influence the process of synaptic pruning.

ANS: A DIF: Difficult REF: Development of Neurons
TOP: Learning Objective 8 MSC: Understanding

63. Which is the most plausible explanation for the increase in risk taking during adolescence?
a. There is a lack of successful campaigns about drug abuse and sexual risk taking.
b. There is a 40 percent drop in the total number of synapses in the frontal lobes from late childhood to adulthood.
c. Gray matter volume decreases in areas associated with sensory and motor functions.
d. There is increased sensitivity to reward cues from the striatum, which overrides control circuits from the prefrontal cortex.

ANS: D DIF: Difficult REF: Puberty and Brain Development
TOP: Learning Objective 8 MSC: Understanding

64. Madison is 11 years old. In the coming years, which part of her brain will experience dramatic changes?
a. frontal lobe
b. occipital lobe
c. parietal lobe
d. temporal lobe

ANS: A DIF: Easy REF: Puberty and Brain Development
TOP: Learning Objective 8 MSC: Applying

SHORT ANSWER

1. Nancy is pregnant with her first child. What factors in Nancy's daily life and environment will influence her baby's prenatal environment?

ANS:
Immediately after conception, the fertilized egg is bathed in a rich mixture of chemicals, including hormones secreted by the mother. Soon, additional hormones are produced by the developing fetus. The prenatal environment is also influenced by the mother's external environment, as it includes substances that the mother has ingested and passed on to the developing fetus. Some of these substances, such as food, are intentionally consumed, but others, such as air pollution, have entered the mother's body without her knowledge. Toward the end of the fetal period, the growing organism is affected by additional environmental factors such as sounds in the outside world as well as tactile sensations created when the mother's stomach is touched.

DIF: Easy REF: Inputs to the Biological System TOP: Learning Objective 1
MSC: Understanding

2. Describe the concept of environmental niche and provide an example.

ANS:
Environmental niches refer to an organism's physical environment, which may differ in the availability of food and other resources. Animals have evolved special adaptations to thrive in their environments. For example, the brush turkey is completely self-sufficient after birth because this species is born on the ground and must immediately find its own food.

DIF: Easy REF: Inputs to the Biological System TOP: Learning Objective 1
MSC: Applying

3. Define experience-dependent plasticity and provide an example of this concept.

ANS:
Experience-dependent plasticity refers to the ability of the brain to be malleable and physically change as the result of experience. For example, when people learn to juggle, there is an increase in gray matter in the brain region associated with the visual processing of motion.

DIF: Easy REF: Experience and Brain Development
TOP: Learning Objective 1 MSC: Applying

4. Differentiate between genotype and phenotype.

ANS:
Genotype is the genetic information encoded as particular alleles in an organism's DNA. Phenotype refers to the ways that the genetic information is expressed or manifested in an organism, including its anatomical structures, its biochemical processes, and its behaviors. Phenotype depends in part on genotype but is also affected by environmental influences.

DIF: Medium REF: Inputs to the Biological System TOP: Learning Objective 1
MSC: Analyzing

5. Describe the structure of DNA.

ANS:
DNA is a long, double-stranded molecule consisting of specific sequences of four different chemical bases (adenine, thymine, guanine, and cytosine). The molecular structure of these four chemicals allows them to link up as base pairs (adenine with thymine and cytosine with guanine) to attach the two strands of the DNA molecule together in a twisting structure called a double helix.

DIF: Medium REF: Inputs to the Biological System TOP: Learning Objective 2
MSC: Understanding

6. Describe dominant-recessive inheritance and provide an example.

ANS:
If individuals are heterozygous, they receive two different alleles of a particular gene. The allele that influences the organism's characteristics is referred to as dominant, and the second allele that has no effect is referred to as recessive. For example, if a child inherits one allele for type A blood and one allele for type O blood, she will have type A blood because the allele for type A is dominant.

DIF: Medium REF: Inputs to the Biological System TOP: Learning Objective 3
MSC: Applying

7. Differentiate between pleiotropic and polygenic genes.

ANS:
A pleiotropic gene affects many traits. The opposite of pleiotropy (one gene affecting many traits) is when a single trait is polygenic, or affected by multiple genes.

DIF: Medium REF: Behavioral Genomics TOP: Learning Objective 3
MSC: Analyzing

8. Explain the landscape of canalization.

ANS:
Waddington depicted the process of specialization during development using the visual representation of a landscape. He described changing cells undergoing a process of canalization through which they get committed to becoming certain types. He likened the differentiating cell to a ball rolling down a landscape with ever-deepening valleys and ridges, which represent different cell outcomes. As the valleys deepen and the ridges grow higher, the likelihood of the ball "jumping" to another valley decreases. Likewise, after a cell begins a particular developmental path, it will be increasingly difficult for it to change course and become a completely different cell type.

DIF: Difficult REF: Constraints on Development TOP: Learning Objective 4
MSC: Understanding

9. Differentiate between meiosis and mitosis.

ANS:
Meiosis is a special kind of cell division that produces the egg and sperm cells. Normal human cells have 23 pairs of chromosomes. One chromosome of each parent goes to the sperm and egg cells. Mitosis gives rise to other kinds of cells throughout the body. The chromosomes from both parents are copied and appear in all the new cells during mitosis.

DIF: Medium REF: Meiosis and Fertilization TOP: Learning Objective 5
MSC: Analyzing

10. Naomi is considering participating as a client in the Nurse-Family Partnership Program. Describe the program for her, noting possible advantages.

ANS:
The Nurse-Family Partnership Program is a program in which nurses visit disadvantaged pregnant women to advise them during their pregnancy and then after the birth of their child. Program participants have fewer medical complications during pregnancy and are less likely to have premature babies. Program participants also interact with their babies in more positive ways.

DIF: Medium REF: Visiting Nurses, Prenatal Care, and Child Development
TOP: Learning Objective 6 MSC: Remembering

11. Outline the hallmarks of the embryonic period.

ANS:
At about 2 weeks after conception, the fertilized egg attaches to the uterine wall. After this implantation, we refer to the fertilized egg as the embryo. The embryonic period lasts until the end of the eighth week after conception. During the embryonic period, the heart starts to beat and limb buds appear. There is some neural activity, and the first elements of most body parts (for example, ears, fingers, and toes) are present.

DIF: Medium REF: Structures and Systems in the Embryo and Fetus
TOP: Learning Objective 6 MSC: Understanding

12. List the major risk factors for preterm birth.

ANS:
Several forms of physical and psychological stress can increase the likelihood of a preterm birth. Risk factors include: infections in either the mother or fetus, maternal substance use (for example, smoking, alcohol, and illegal drugs), and maternal stress.

DIF: Medium REF: Preterm Births TOP: Learning Objective 6
MSC: Understanding

13. What does the phrase "ontogeny recapitulates phylogeny" mean?

ANS:
Ontogeny refers to the development of an organism and phylogeny refers to evolutionary lineage. According to this hypothesis, the development of an embryo follows the same course as the species' evolutionary history.

DIF: Medium REF: Why Does Anatomical Development Progress As It Does?
TOP: Learning Objective 6 MSC: Understanding

14. How do the frontal lobes change during the teenage years?

ANS:
The frontal lobes undergo significant pruning of synaptic connections during adolescence. This decrease in the number of synapses is thought to streamline the region's neural circuits to support faster and more efficient performance. At the same time, the amount of white matter in the frontal lobes substantially increases. The section of the frontal lobes called the prefrontal cortex matures the latest with growth into the 20s.

DIF: Medium REF: Puberty and Brain Development TOP: Learning Objective 6
MSC: Understanding

15. Describe the structure of a neuron.

ANS:
The neuron consists of a cell body with a nucleus, dendrites, an axon, and axon terminals. The dendrites have receptors that receive chemical signals from other neurons. The axon is a tubelike projection that conducts electrical impulses away from the cell body. The axon terminal is the end of the axon, which releases neurotransmitters into the synapse.

DIF: Easy REF: Neurons and Neurotransmitters TOP: Learning Objective 7
MSC: Understanding