1. An important finding of the Minnesota Study of Twins Reared Apart is the extent of the:
   A) similarity of the twins in a wide range of behavioural traits.
   B) similarity of the twins in a wide range of physical traits.
   C) differences between the twins on the vast majority of behavioural traits.
   D) differences between the twins on many physical traits.

2. Which factor is a problem with the assumption that the similarities of twins in the Minnesota Study are due to genetic factors?
   A) Not all of the twins were identical.
   B) The environments of the twins may have been similar.
   C) The adoptive parents and siblings were not compared to the biological twins and siblings.
   D) All of these factors are problems with the assumption.

3. In a study of eminent men, Francis Galton concluded that achievement and talent are:
   A) predominantly due to the environment.
   B) predominantly due to heredity.
   C) due to a combination of environment and heredity.
   D) due to an interaction of environment and heredity.

4. The structure of DNA was identified by _____ and a colleague.
   A) James Watson
   B) Gregor Mendel
   C) John Stuart Mill
   D) Francis Galton

5. The complete set of genes is referred to as a:
   A) genome.
   B) genesis.
   C) genotype.
   D) genode.

6. The mapping of the human genome has resulted in the insight that humans share a large proportion of their genes with all of the following EXCEPT:
   A) bacteria.
   B) bears.
   C) beans.
   D) butterflies.

7. The current BEST estimate is that humans have approximately _____ genes.
   A) 19,000
   B) 35,000
   C) 100,000
   D) 275,000

8. The majority of human genes are devoted to making human beings:
   A) male or female.
   B) primates.
   C) animals.
   D) humans.

9. The observable expression of an individual's genetic material is referred to as the individual's:
   A) genome.
   B) genotype.
   C) phenotype.
   D) environment.

10. Pamela and her mother both have a strong aversion to cheese. Consider these paths. Path A: Pamela genetically inherited “cheese aversion” from her mother. Path B: Pamela's mother's own genetically inherited “cheese aversion” led her to create a “cheese aversion” environment in which Pamela developed. Path C: Pamela's mother's aversion to cheese caused Pamela's genotype to change. Which path(s) could have caused this similarity between Pamela and her mother in their strong aversion to cheese?
    A) both paths A and B
    B) both paths A and C
    C) both paths B and C
    D) path B only

11. Genes are sections of:
    A) chromosomes.
    B) proteins.
    C) genotypes.
    D) phenotypes.

12. Which statement about genetics is TRUE?
    A) DNA is made up of two twisted chromosomes.
    B) Genes are made up of two twisted chromosomes.
    C) Chromosomes are made up of two twisted strands of DNA.
    D) Genes are made up of two twisted strands of DNA.

13. Genes code for:
    A) the production of proteins.
    B) specific behaviours.
    C) the construction of DNA.
    D) traits.

14. Which statement about genetics is TRUE?
    A) Genes are sections of chromosomes.
    B) Chromosomes are sections of genes.
    C) Chromosomes are sections of DNA.
    D) DNA is a section of a gene.

15. As reported in the text, the current scientific understanding is that protein-coding genes make up approximately what percentage of the human genome?
    A) 2
    B) 20
    C) 96
    D) 100

16. Which statement BEST characterizes current scientific thought on the human genome?
    A) The greatest portion of the genome is made up of what is now considered "junk" DNA.
    B) A small part of the genome is made up of protein-coding genes, and a much larger part regulates the activity of genes.
    C) The genome is split about evenly between protein-coding genes and "junk" DNA.
    D) The majority of the genome is made up of protein-coding genes, and a much smaller part is made up of noncoding DNA.

17. With the exception of the genes on the X and Y chromosomes, how many copies of each type of gene does an individual generally carry?
    A) one
    B) two
    C) three
    D) four

18. Which factor is a direct contributor to a child's genotype?
    A) the parents' genotypes
    B) the parents' phenotypes
    C) the child's phenotype
    D) all of these factors

19. Which factor(s) is/are a direct contributor to a child's phenotype?
    A) the child's genotype and the parents' phenotypes
    B) the child's environment
    C) the parents' genotypes
    D) the child's genotype and environment

20. Individuals receive _____ copy/copies of each gene from their mother.
    A) one
    B) two
    C) three
    D) four

21. Children share _____ of their genetic material with each of their grandparents.
    A) one-half
    B) one-third
    C) one-quarter
    D) one-eighth

22. Which statement about sex determination is TRUE?
    A) The mother's egg always determines the sex of the offspring.
    B) The father's sperm always determines the sex of the offspring.
    C) Sometimes, it is the mother's egg and sometimes, it is the father's sperm that determines the sex of the offspring.
    D) The mother's egg and the father's sperm jointly determine the sex of the offspring.

23. Which statement about sex determination is TRUE?
    A) The presence of a single X chromosome makes an individual female.
    B) The presence of a single X chromosome makes an individual male.
    C) The presence of a Y chromosome makes an individual female.
    D) The presence of a Y chromosome makes an individual male.

24. Which sequence lists the CORRECT order of events in the development of a male?
    A) Y chromosome encodes protein, production of testosterone, prenatal formation of testes
    B) Y chromosome encodes protein, prenatal formation of testes, production of testosterone
    C) prenatal formation of testes, Y chromosome encodes protein, production of testosterone
    D) production of testosterone, Y chromosome encodes protein, prenatal formation of testes

25. A male zygote has the _____ pattern of sex chromosomes.
    A) XX
    B) XY
    C) YY
    D) XY or YY

26. A change in a section of DNA that is the result of either a random, spontaneous error or environmental factors is referred to as:
    A) polygenic inheritance.
    B) a dominant–recessive pattern.
    C) random assortment.
    D) a mutation.

27. Which statement about mutations is TRUE?
    A) Mutations may make an individual more likely to survive long enough to produce offspring.
    B) Mutations always occur in germ cells.
    C) Mutations are the only source of genetic disease.
    D) Mutations are created when two members of a pair of chromosomes swap pieces of DNA.

28. In regard to the chromosomes that parents pass on to their offspring, parents pass on:
    A) exact copies of their chromosomes to their offspring.
    B) exact copies of their chromosomes to their offspring, except when a mutation occurs in the offspring's genes.
    C) chromosomes that are constituted differently than their own because of random assortment and crossing over.
    D) exact copies of their chromosomes to their offspring, but the genes are expressed differently because of patterns of dominance.

29. Which factor is the basis of evolution?
    A) random assortment of chromosomes
    B) mutations
    C) the process of crossing over
    D) all of these factors

30. Crossing over refers to:
    A) the development of female genitalia by an XY zygote.
    B) a process by which two members of a chromosomal pair swap sections of DNA.
    C) the random shuffling of the members of the 23 chromosomal pairs in the formation of egg and sperm.
    D) a change in a section of DNA caused by environmental factors.

31. Which statement about gene expression is TRUE?
    A) All genes possessed by an individual are expressed continuously.
    B) All genes contained in a particular cell are expressed in that cell, but not all genes are contained in every cell.
    C) Some genes are expressed for only a short period of the cell's life.
    D) All genes possessed by an individual are expressed at some point in the individual's life.

32. Regulator genes are responsible for:
    A) ensuring that all of the sperm's genetic material is inserted into the egg.
    B) activating and deactivating other genes.
    C) determining which genes go into which cell.
    D) establishing an embryo's sex.

33. Developmental changes such as puberty, graying hair, and the reduced organ capacity that comes with age are caused in part by:
    A) norm of reaction.
    B) homozygous alleles.
    C) polygenic inheritance.
    D) regulator genes.

34. Which statement about genes is TRUE?
    A) Genes that are turned off by regulator genes remain off for the remainder of the person's life.
    B) Regulator genes function without input from the environment.
    C) Genes belong to extensive networks of genes and do not function in isolation.
    D) All of the statements are true.

35. _____ genes are expressed when an individual is heterozygous for a trait that follows a Mendelian inheritance pattern.
    A) Recessive
    B) Dominant
    C) Polygenic
    D) Allele

36. Different forms of a gene are referred to as:
    A) alleles.
    B) regulators.
    C) recessive genes.
    D) chromosomes.

37. If an individual is heterozygous for a trait, he has inherited two _____ allele(s) for that trait.
    A) of the same
    B) different
    C) dominant
    D) recessive

38. The gene that codes for characteristic X has two alleles. Allele *D* is dominant, and allele *r* is recessive. If the father is homozygous for trait X with allele *r* and the mother is heterozygous for trait X, the chance that one of their offspring will exhibit form *r* for trait X is _____%.
    A) 0
    B) 25
    C) 50
    D) 75

39. A recessive gene governs trait M. If a child exhibits trait M, then:
    A) both her parents must have also exhibited trait M.
    B) both her parents must have the recessive gene for trait M.
    C) one of her parents has the gene for trait M.
    D) the child has to have a dominant gene for trait M.

40. Geneticist Geri notices that a woman exhibits trait L. With certainty, she asks the woman, “Which of your parents also exhibits this trait?” The woman is surprised that Geri knew that one of her parents had to also display trait L. Knowing which fact would have cleared up the woman's confusion?
    A) Trait L is governed by a dominant allele.
    B) Trait L is governed by a recessive allele.
    C) Trait L involves polygenic inheritance.
    D) None of these would help to clear up the confusion.

41. Kody, a boy, and Shakira, a girl, are brother and sister. They both inherit the same recessive allele for trait T on their X chromosome from their mother. What is the relative likelihood of Kody and Shakira expressing trait T?
    A) Both Kody and Shakira are likely to express trait T.
    B) Kody is more likely than is Shakira to express trait T.
    C) Shakira is more likely than is Kody to express trait T.
    D) Neither Kody nor Shakira is likely to express trait T.

42. Sex-linked disorders associated with the X chromosome are:
    A) more likely to affect males.
    B) more likely to affect females.
    C) equally likely to affect males and females.
    D) a result of fragile X syndrome.

43. Polygenic inheritance refers to:
    A) a single gene affecting multiple traits.
    B) the blending of genes in heterozygous individuals.
    C) dominant–recessive patterns of inheritance.
    D) the combined action of multiple genes.

44. When several genes contribute to a particular phenotypic outcome, this is referred to as:
    A) Mendelian inheritance.
    B) a heterozygous inheritance.
    C) multifactorial expression.
    D) polygenic inheritance.

45. Psychological traits, such as empathy, aggression, and shyness, follow the _____ type of inheritance pattern.
    A) dominant–recessive
    B) X-linked
    C) polygenic
    D) heterozygous

46. Which statement about traits that involve polygenic inheritance is TRUE?
    A) These traits are passed down from either the mother or the father directly to the offspring.
    B) These traits are expressed only if an individual has a dominant gene.
    C) Offspring have a one-in-four chance of possessing a trait if the parents possess it.
    D) Many common human disorders are believed to result from interactions among multiple inherited genes, often in conjunction with environmental factors.

47. All the outcomes that could theoretically result from a given genotype are referred to as the:
    A) polygenic inheritance.
    B) genotype–environment interaction.
    C) phenotype.
    D) norm of reaction.

48. Identical twins Ilyse and Lauren both have a gene for trait H. The gene for trait H is expressed only when a child eats rice before the age of 2 years. Ilyse and Lauren are separated at birth, and Ilyse lives in Japan, where babies begin eating rice at an early age. Lauren lives in Canada, and she is not given rice before the age of 2 years. Ilyse develops trait H, whereas Lauren does not develop the trait. This is an example of:
    A) polygenic inheritance.
    B) genotype–environment interaction.
    C) phenotypical variety.
    D) the dominant–recessive pattern of inheritance.

49. The manner in which individuals develop phenylketonuria is an example of:
    A) genotype–environment interaction.
    B) phenotype–environment interaction.
    C) direct inheritance.
    D) polygenic inheritance.

50. Phenylketonuria originates from:
    A) a chromosomal anomaly.
    B) sex-linked inheritance.
    C) a dominant–recessive pattern.
    D) polygenic inheritance.

51. Many psychiatric and behavioural disorders are believed to involve:
    A) gene anomalies.
    B) polygenic inheritance.
    C) Mendelian patterns.
    D) chromosomal anomalies.

52. A person who has a genetic disorder that results from a chromosomal anomaly possesses:
    A) two recessive genes for the disorder.
    B) extra or missing genes.
    C) multiple genes that code for the disorder.
    D) more or fewer than the normal number of chromosomes.

53. Down syndrome originates from:
    A) chromosomal anomalies.
    B) polygenic inheritance.
    C) dominant–recessive patterns.
    D) gene anomalies.

54. Disease W is a recessive gene disease. Individuals with _____ will suffer from disease W.
    A) one disease W gene and one healthy gene
    B) two disease W genes
    C) two healthy genes
    D) two disease W genes and one healthy gene

55. Which property is a NOT mechanism for genetic inheritance of disease?
    A) combined action of multiple genes
    B) dominant–recessive patterns
    C) sex-linked inheritance
    D) hormonal abnormalities

56. A clear relationship between the severity of the gene anomaly and the resulting phenotype is displayed by examining the genetic underpinnings of:
    A) Down syndrome.
    B) Williams syndrome.
    C) autism spectrum disorder.
    D) all of these.

57. A disorder in which an individual is born with female genitalia but is found to be genetically male may be a result of:
    A) a faulty dominant–recessive pattern.
    B) Down syndrome.
    C) a defect in regulator genes.
    D) a sex-linked disorder.

58. Which statement about autism spectrum disorder is TRUE?
    A) It is likely that autism spectrum disorder is caused by the MMR vaccine.
    B) It is clear that the cause of autism spectrum disorder is solely genetic.
    C) Approximately 1 in 1500 children in Canada have been diagnosed with autism spectrum disorder.
    D) Autism spectrum disorder is known to be highly heritable.

59. The research on the effects of abusive parenting on children with a particular genotype demonstrated that:
    A) child abuse is genetically inherited.
    B) specific genetic risk factors can make some individuals more susceptible than others to particular environmental events.
    C) some people have a greater extent of brain plasticity than do others.
    D) children's phenotypes lead them to be active creators of their own environments.

60. The influence of the child's _____ on his/her _____ represents the active child theme.
    A) genotype; phenotype
    B) environment; phenotype
    C) phenotype; environment
    D) genotype; environment

61. Which effect(s) is/are an example of the relationship between the child's phenotype and the child's environment? Effect A: effect of the environment created by the child's parents on the child's behaviour. Effect B: effect of the child's interests on the environment the child seeks out. Effect C: effect of the child's behaviour on the parents' responses to the child.
    A) both effects A and B
    B) both effects A and C
    C) both effects B and C
    D) effects A, B, and C

62. Lenny is a very active toddler who began to crawl, pull himself up to a standing position, walk, climb, and run at a very early age. Which statement is NOT an example of a way in which Lenny's phenotype may affect his environment?
    A) Chasing Lenny and keeping him safe has made his parents very tired and stressed, resulting in a lack of patience with Lenny.
    B) Lenny regularly seeks out new adventures, such as climbing to the top of his backyard swing set, in which he often gets injured and must be seen by a doctor.
    C) In an attempt to get Lenny to use his high activity level in a constructive manner, his parents enroll him in a gymnastics class.
    D) Lenny's father is also quite active, and he frequently brings Lenny to the playground, athletic games, and amusement parks.

63. Epigenetics is MOST relevant to which relationship?
    A) child's environment–child's phenotype
    B) child's phenotype–child's environment
    C) child's genotype–child's phenotype
    D) child's environment–child's genotype

64. Which statement is TRUE?
    A) Mutations aside, the structure of DNA remains fixed throughout one's life.
    B) Epigenetic mechanisms can alter the expression of genes.
    C) Changes in the expression of genes can be passed on to offspring.
    D) Each gene is a segment of DNA that is the code for the production of particular proteins.

65. Gene expression can be suppressed by the process of:
    A) methylation.
    B) mutation.
    C) recession.
    D) myelination.

66. Eddie and Freddy are identical twins who grew up in the same home but then went their separate ways after high school. Eddie moved to the Prairies and became a family farmer. Freddy moved to Toronto and became a high-powered attorney. A university research project measures their DNA methylation levels at age 6 years, age 36 years, and age 60 years. Which statement MOST likely reflects the results?
    A) Eddie and Freddy will have virtually no differences in their methylation levels.
    B) Eddie and Freddy will have vastly different methylation levels at all ages.
    C) Eddie and Freddy's methylation levels at age 6 years will be similar but will diverge as they get older.
    D) There is no way to predict Eddie and Freddy's comparative methylation levels.

67. _____ can be done at any point in an individual's life span in order to diagnose a disease or find genetic clues that predict the likelihood of developing a disease.
    A) Genetic testing
    B) Newborn screening
    C) Prenatal testing
    D) Pharmacogenomics testing

68. Genetic testing is used frequently for _____, which is using information about an individual's genetic makeup to determine which course of treatment is most likely to be effective.
    A) pharmacogenomics testing
    B) genetic testing
    C) newborn screening
    D) carrier genetic testing

69. Marika and her husband would like to have a baby. Today, Marika has an appointment with her obstetrician. They will determine if she is a carrier of a specific disorder that could impact the development of a baby. This is known as:
    A) genetic testing.
    B) newborn screening.
    C) prenatal testing.
    D) pharmacogenomics testing.

70. Which individual has an increased likelihood of carrying the recessive gene for Tay–Sachs disease?
    A) Maria, who is from the Caribbean
    B) Mark, who is African American
    C) Samantha, who is Latino
    D) Jacob, who is of Eastern European Jewish descent

71. This type of testing is typically offered to those who have an increased likelihood of carrying the recessive gene for Tay–Sachs disease.
    A) carrier genetic testing
    B) genetic testing
    C) newborn screening
    D) pharmacogenomics testing

72. This disorder causes a severe birth defect that culminates in death by the age of 5 years.
    A) Down syndrome
    B) Edwards syndrome
    C) Tay–Sachs disease
    D) Patau syndrome

73. Which individual has an increased likelihood of carrying the recessive gene for sickle-cell disease?
    A) Omari, who is of African descent
    B) Juan, who is from Mexico
    C) Marko, who is of Eastern European Jewish descent
    D) Stacey, who is Caucasian

74. Juan and Kaya would like to have a baby. They are getting tested to determine if either of them is a carrier of a recessive gene for sickle-cell disease. What is the likelihood that their child would develop the disease if both parents are carriers?
    A) 10%
    B) 25%
    C) 35%
    D) 75%

75. This type of testing is genetic testing during pregnancy.
    A) prenatal testing
    B) PKY testing
    C) newborn screening
    D) pharmacogenomics testing

76. Jacquelynne is 6 months pregnant and is having blood drawn for genetic testing of her baby. What type of testing is this?
    A) prenatal screening test
    B) PKU testing
    C) newborn screening
    D) pharmacogenomics testing

77. Ashley is currently 5 months pregnant. When she had an ultrasound performed, her obstetrician found a suspected abnormality with her pregnancy. Today, they are taking a sample of the amniotic fluid to do further testing. What type of test is this?
    A) prenatal screening test
    B) CVS
    C) amniocentesis
    D) IVF

78. This is a genetic disorder that results from either missing chromosomes or having extra chromosomes. The severity of this disorder depends on the location of the chromosomal abnormality.
    A) trisomy 18
    B) Patau syndrome
    C) aneuploidy
    D) sickle-cell disease

79. _____ lead(s) to extremely high rates of fetal and infant mortality.
    A) Edwards syndrome
    B) Patau syndrome
    C) Both Edwards syndrome and Patau syndrome
    D) Neither Edwards syndrome nor Patau syndrome

80. This provincial genetic screening program is offered in every Canadian province.
    A) carrier genetic testing
    B) newborn screening
    C) prenatal testing
    D) prenatal diagnostic screening

81. Which of the following countries is the only G7 country to not have a law prohibiting the use of genetic information in insurance or employment decisions?
    A) the United States
    B) Germany
    C) Canada
    D) the United Kingdom

82. Behaviour geneticists believe that _____ of the behavioural traits of human beings are influenced at least to some degree by genetic factors.
    A) none
    B) a small percentage
    C) about half
    D) all

83. Traits that are influenced by genetic factors are considered:
    A) multifactorial.
    B) heritable.
    C) sex-linked.
    D) environmental.

84. Traits that are influenced by a number of environmental and genetic factors are considered:
    A) multifactorial.
    B) heritable.
    C) experience-dependent.
    D) polygenetic.

85. Behaviour genetics rests in part on the premise that, to the extent that genetic factors are important, individuals who _____ should be more similar than are individuals who _____.
    A) are closely related; are unrelated
    B) are unrelated; are closely related
    C) have lived together; have not lived together
    D) have not lived together; have lived together

86. Behaviour genetics rests in part on the premise that, to the extent that environmental factors are important, individuals who _____ should be more similar than are individuals who _____.
    A) are closely related; are unrelated
    B) are unrelated; are closely related
    C) have lived together; have not lived together
    D) have not lived together; have lived together

87. A researcher finds that, for a particular trait, first cousins are more similar than are third cousins. This researcher has evidence that the trait is:
    A) heritable.
    B) polygenic.
    C) multifactorial.
    D) all of these.

88. A researcher finds that, for a particular trait, the correlation between identical twins is greater than is the correlation between nontwin siblings. This result demonstrates that:
    A) environmental factors are important in the development of this trait.
    B) genetic factors are important in the development of this trait.
    C) genetic factors are not important in the development of this trait.
    D) environmental factors are not important in the development of this trait.

89. Genetic influence in behaviour genetics family studies is demonstrated by _____ correlations for higher degrees of _____ similarity.
    A) higher; genetic
    B) lower; genetic
    C) higher; environmental
    D) lower; environmental

90. If the correlation between identical twins on trait R is higher than is the correlation between fraternal twins on trait R, behaviour geneticists conclude that:
    A) genetic factors are important in the development of trait R.
    B) genetic factors are irrelevant to the development of trait R.
    C) environmental factors are irrelevant in the development of trait R.
    D) genetic factors and environmental factors play equivalent roles in the development of trait R.

91. The twin-study design compares:
    A) siblings who have lived together to those who have not.
    B) same-sex twins to opposite-sex twins.
    C) identical twins reared together to identical twins reared apart.
    D) identical twins to fraternal twins.

92. A twin study is conducted to examine the role of genetics and environment on the fondness of individuals for chocolate. Which result would lead to the conclusion that genetic factors are important in the development of this trait?
    A) Twins who have lived together are more similar on the trait than twins who have lived apart.
    B) Twins who have lived apart are more similar on the trait than twins who have lived together.
    C) Identical twins are more similar on the trait than fraternal twins.
    D) Fraternal twins are more similar on the trait than identical twins.

93. An adoptive twin study is conducted to examine the role of genetics and environment on sociability. Which result would lead to a conclusion that environmental factors are important in the development of this trait?
    A) Identical twins reared together are more similar on the trait than are identical twins reared apart.
    B) Identical twins reared together are no more similar on the trait than are identical twins reared apart.
    C) Identical twins reared together are less similar on the trait than are identical twins reared apart.
    D) Identical twins reared apart are more similar on the trait than are fraternal twins reared apart.

94. Which design would be ideal for studying behaviour genetics?
    A) an adoption study
    B) a family study
    C) an adoptive twin study
    D) a twin study

95. A study that examines whether adopted children's scores on a particular measure are more highly correlated with their adoptive parents' scores or their biological parents' scores is referred to as a(n) _____ study.
    A) adoption
    B) adoptive twin
    C) twin
    D) heritability

96. In an adoption study designed to examine genetic and environmental influences, the correlation between _____ on a particular trait is compared to the correlation between _____ on that trait.
    A) adopted children and their adoptive parents; biological children and their biological parents
    B) fraternal twins raised apart; identical twins raised apart
    C) identical twins raised apart; identical twins raised together
    D) adopted children and their adoptive parents; adopted children and their biological parents

97. Dr. Spock is interested in examining genetic and environmental influences on enjoyment of reading. She has decided to include fraternal twins in her study. If she finds that the correlation between fraternal twins on enjoyment of reading is higher than is the correlation between _____ on this measure, then she has evidence for the influence of _____.
    A) identical twins; environment and genetics
    B) nontwin siblings; environment and genetics
    C) fraternal twins reared apart; environment
    D) identical twins reared apart; genetics

98. Which statement describes evidence for the importance of environmental factors in the development of a particular trait?
    A) An adoptive twin study shows that the correlation between identical twins who grew up together is higher than is the correlation between identical twins who grew up apart.
    B) A twin study shows that the correlation between identical twins is higher than is the correlation between fraternal twins.
    C) An adoption study shows that the correlation between adoptive children and their biological parents is higher than is the correlation between the children and their adoptive parents.
    D) All of the statements describe such evidence.

99. Which behaviour genetics research result provides the BEST evidence of the importance of environmental factors in the development of a particular trait?
    A) An adoption study shows that the correlation between adoptive children and their adoptive parents is higher than is the correlation between the children and their biological parents.
    B) An adoptive twin study shows that the correlation between identical twins who grew up together is higher than is the correlation between identical twins who grew up apart.
    C) A twin study shows that the correlation between identical twins is higher than is the correlation between same-sex fraternal twins.
    D) A family study shows that the correlation between siblings reared together is higher than is the correlation between siblings reared apart.

100. The finding that identical twins reared together are more similar in intelligence than are identical twins reared apart is evidence for:
    A) the importance of genetic factors.
    B) the importance of environmental factors.
    C) the interplay between genes and environment.
    D) all of these.

101. A finding that siblings reared together are more similar in intelligence than are half-siblings (individuals who share one parent) reared together would be evidence for:
    A) the importance of genetic factors.
    B) the importance of environmental factors.
    C) the interplay between genes and environment.
    D) all of these.

102. Which statement provides the BEST evidence for the argument that intelligence has a genetic influence?
    A) Identical twins are not identical in IQ.
    B) Identical twins are more similar in intelligence than are fraternal twins.
    C) Fraternal twins are more similar in intelligence when they are reared together than when they are reared apart.
    D) Fraternal twins become less similar in intelligence as they get older.

103. Which statement is the BEST evidence for the notion that individuals actively construct their environment?
    A) Identical twins are quite similar in intelligence, regardless of whether they are reared together or apart.
    B) Identical twins are more similar than are fraternal twins in intelligence.
    C) Fraternal twins are more similar in intelligence when they are reared together than when they are reared apart.
    D) Fraternal twins become less similar in intelligence as they get older.

104. Which twins are LEAST similar in intelligence?
    A) identical twins in childhood
    B) identical twins in adulthood
    C) fraternal twins in childhood
    D) fraternal twins in adulthood

105. A large study of MZ and DZ twin pairs across multiple countries found that the correlations in IQ between co-twins _____ with age for DZ twins and _____ with age for MZ twins.
    A) decreased; increased
    B) increased; decreased
    C) increased; stayed the same
    D) decreased; stayed the same

106. Which statement describes the results of a large twin study conducted in multiple countries on the genetic and environmental influences on IQ?
    A) Genetic influences decrease with age.
    B) Genetic influences remain stable with age.
    C) Genetic influences increase with age.
    D) Environmental influences remain stable with age.

107. The amount of variability of a trait that is due to genetic and environmental factors is referred to as:
    A) heritability.
    B) inheritance.
    C) the genotype.
    D) shared genes.

108. The heritability score for athletic ability estimates the:
    A) relative contributions of genetic and environmental factors in the development of an individual's athletic ability.
    B) amount of variation in athletic ability in an entire population that is due to differences in their genes.
    C) level of genetic influence on an individual's athletic ability.
    D) extent of influence of evolution on a population's athletic ability.

109. Imagine that researchers estimated the heritability score for trait W to be 45%. Which statement is a CORRECT interpretation of this estimate?
    A) Differences between African Americans and European Americans on trait W are 45% due to differences in their genetic makeup.
    B) Jane Doe's level of trait W is 45% due to her genes.
    C) The amount of variation in trait W in an entire population is 45% due to genetic factors.
    D) All of these statements are correct interpretations of the estimate.

110. Imagine that researchers estimated the heritability score for trait T to be 75%. Which statement is a CORRECT interpretation of this estimate?
    A) There is little individuals can do to improve their level of trait T.
    B) John Smith's level of trait T is 75% due to his genes.
    C) Differences between males and females on trait T are 75% due to differences in the genetic makeup of males and females.
    D) This heritability estimate tells us nothing about the relative contribution of genetic and environmental factors for the development of trait T in an individual.

111. Which statement about heritability estimates is TRUE?
    A) Heritability estimates suggest the existence of genes for particular behavioural patterns, such as divorce.
    B) Heritability estimates can differ dramatically for groups of people in very different environments.
    C) Heritability estimates are informative in determining the relative genetic and environmental contributions in the development of a particular individual.
    D) Heritability estimates indicate the level of changeability of the trait.

112. As environmental variability increases, heritability estimates will:
    A) increase.
    B) decrease.
    C) remain the same.
    D) sometimes increase and sometimes decrease.

113. Heritability estimates for IQ appear to be:
    A) stable across the SES spectrum.
    B) higher for those of high SES than for those of low SES.
    C) higher for those of low SES than for those of high SES.
    D) unpredictable across the SES spectrum.

114. Mandy and Candy are fraternal twins who were reared together. Bernie and Ernie are identical twins who were reared together. Which statement is MOST likely to be true?
    A) Mandy and Candy are more genetically similar to each other than are Bernie and Ernie.
    B) Mandy and Candy are as genetically similar to each other as are Bernie and Ernie.
    C) Mandy and Candy have the same level of shared environment as do Bernie and Ernie.
    D) Mandy and Candy have a greater level of shared environment than do Bernie and Ernie.

115. Behaviour genetic studies have revealed that fraternal twins reared together and identical twins reared together are equally similar on trait Q. This indicates the importance of:
    A) shared genetics.
    B) nonshared genetics.
    C) shared environment.
    D) nonshared environment.

116. Shared-environment influences have been demonstrated for:
    A) schizophrenia.
    B) positive emotions in toddlers.
    C) personality.
    D) all of these.

117. Brain cells that are specialized for transmitting electrical messages are called:
    A) neurons.
    B) dendrites.
    C) synapses.
    D) glial cells.

118. Interneurons serve as the intermediaries between:
    A) axons and dendrites in the same neuron.
    B) cell bodies and synapses.
    C) sensory and motor neurons.
    D) axons and axon terminals.

119. The three main components of neurons are:
    A) axons, interneurons, and dendrites.
    B) cell bodies, glials, and synapses.
    C) dendrites, cell bodies, and axons.
    D) cell bodies, axons, and myelin.

120. Which part of the neuron receives input from other cells?
    A) the axon
    B) the synapse
    C) the cell body
    D) the dendrite

121. Which part of the neuron conducts electrical impulses toward the cell body?
    A) the axon
    B) the synapse
    C) the interneuron
    D) the dendrite

122. Which part of the neuron can be the LARGEST in size?
    A) the axon
    B) the synapse
    C) the cell body
    D) the dendrite

123. Which statement about synapses is TRUE?
    A) Synapses keep the neuron functioning.
    B) Synapses are the connections between neurons.
    C) Synapses conduct electrical signals away from the cell body.
    D) Synapses contain DNA.

124. Which structures increase the speed and efficiency of electrical impulse transmission?
    A) myelin sheath
    B) synapses
    C) dendrites
    D) glial cells

125. Carrie complains to her doctor about having trouble with physical and cognitive tasks that she used to be able to do easily. Her doctor runs a number of tests and determines that Carrie's brain is not efficiently transmitting information. Which problem is LEAST likely to be a culprit?
    A) The synapses in her nervous system have collapsed.
    B) The myelin in her nervous system is decaying.
    C) The dendrites in her nervous system are not properly passing along information to other cells.
    D) All of these are equally likely culprits.

126. In an individual with poor myelination, the MOST likely cause would be found in his:
    A) glial cells.
    B) interneurons.
    C) synapses.
    D) axon terminals.

127. The cerebral cortex constitutes _____% of the human brain.
    A) 10
    B) 25
    C) 80
    D) 100

128. The folds of the cerebral cortex:
    A) hold the myelin that increases the efficiency of the neurons.
    B) permit the brain to be constantly bathed in protective fluid.
    C) facilitate the communication of its different lobes.
    D) allow more cortex to be packed into a small area.

129. Which statement about the cerebral cortex is NOT true?
    A) The function of the cerebral cortex is essentially identical across a wide variety of animal species.
    B) The lobes of the cerebral cortex differ in the general tasks with which they are associated.
    C) The size of the cerebral cortex is unrelated to its function.
    D) All of these statements are true.

130. Which lobe of the cerebral cortex is MOST important for the processing of emotion and auditory information?
    A) temporal
    B) parietal
    C) frontal
    D) occipital

131. Which lobe of the cerebral cortex is MOST important for foresight and goal-directed behaviour?
    A) temporal
    B) parietal
    C) frontal
    D) occipital

132. An individual suffers brain damage to one small area of the brain. As a result, he struggles to process visual information. Which area has he MOST likely injured?
    A) frontal lobe
    B) corpus callosum
    C) occipital lobe
    D) parietal lobe

133. Information from multiple sensory systems is processed and integrated in the:
    A) frontal lobe.
    B) corpus callosum.
    C) glial cells.
    D) association areas.

134. The two hemispheres of the brain communicate via the:
    A) interneurons.
    B) corpus callosum.
    C) glial cells.
    D) association areas.

135. For a right-handed person, the left hemisphere processes information in a piecemeal, linear manner, whereas the right hemisphere processes information in a holistic manner. This occurrence is a result of:
    A) association area specialization.
    B) corpus callosum communication.
    C) frontal lobe management.
    D) cerebral lateralization.

136. Neurogenesis is essentially complete by approximately:
    A) 2 weeks after conception.
    B) 18 weeks after conception.
    C) 9 months after birth.
    D) age 6 years.

137. Neurogenesis occurs through:
    A) cell division.
    B) cell death.
    C) myelination.
    D) synaptogenesis.

138. Which statement about neurogenesis is TRUE?
    A) It concludes at around 18 weeks after conception.
    B) It is predetermined by genetics throughout life.
    C) It increases and decreases depending on the environment.
    D) None of these statements is true.

139. Which list identifies the CORRECT sequence of the developmental processes of neurons?
    A) neurogenesis, migration, axon growth, arborization, myelination
    B) neurogenesis, axon growth, arborization, migration, myelination
    C) neurogenesis, arborization, myelination, migration, axon growth
    D) axon growth, arborization, myelination, neurogenesis, migration

140. Which method for examining the specific areas of the brain associated with particular behaviours, thoughts, and feelings is MOST likely to be used with infants and young children?
    A) positron emission tomography (PET) scan
    B) functional magnetic resonance imaging (fMRI)
    C) electrophysiological recording
    D) autopsy

141. Changes in the brain's electrical activity in response to a particular stimulus are referred to as:
    A) functional magnetic resonance images.
    B) electrophysiological recordings.
    C) norms of reaction.
    D) event-related potentials.

142. Which process INCREASES the capacity of dendrites to form connections with other neurons?
    A) synaptic pruning
    B) arborization
    C) myelination
    D) formation of axon spines

143. Which statement about the process of myelination is true?
    A) Myelination occurs in a similar pattern in humans and chimpanzees.
    B) Cortical areas become myelinated at approximately the same rates.
    C) Myelination begins at the cortex and moves down into the brain stem.
    D) Myelination begins in the brain before birth and continues into early adulthood.

144. In the process of synaptogenesis:
    A) axons are insulated.
    B) neurons are created through cell division.
    C) connections between neurons are formed.
    D) the brain eliminates unnecessary synapses.

145. During synaptogenesis, each neuron forms synapses with approximately how many other neurons?
    A) tens
    B) hundreds
    C) thousands
    D) millions

146. The different rates of synapse production in different areas of the brain indicate the:
    A) incapability of the brain to develop simultaneously in multiple areas.
    B) differences in the timing of development of different skills and behavioural categories.
    C) different rates of synapse elimination.
    D) All of the answers are correct.

147. Over the life span, the density of synapses in a particular cortical area:
    A) increases at a stable rate throughout life.
    B) continues to increase sharply after birth and then remains stable throughout life.
    C) decreases at a steady rate after birth.
    D) continues to increase sharply after birth and shows some level of decrease with age.

148. In regard to the pattern of synaptogenesis in the prefrontal cortex and the visual cortex, synaptogenesis:
    A) occurs at approximately the same rate in these two areas across the life span.
    B) occurs earlier in the prefrontal cortex than in the visual cortex.
    C) is complete earlier in the visual cortex than in the prefrontal cortex.
    D) occurs at a faster rate in the prefrontal cortex than in the visual cortex.

149. Synapse elimination generally occurs as a result of:
    A) brain damage.
    B) nutritional deficiencies.
    C) normal overabundance of synapses.
    D) mental retardation.

150. Synaptic pruning refers to which process?
    A) elimination
    B) generation
    C) repair
    D) arborization

151. Which statement about synesthesia is NOT true?
    A) Experiencing the sound of a bell as the colour yellow is an example of synesthesia.
    B) Synesthesia may be experienced by newborns.
    C) Synesthesia is caused by an overabundance of synapses.
    D) Synesthesia is not experienced by infants and newborns.

152. The impulsive, irrational behaviour characteristic of adolescents may be due to:
    A) an underdeveloped prefrontal cortex.
    B) a steady decrease in white matter.
    C) underproduction of association areas.
    D) synaptic pruning.

153. _____ is a normal part of development, which is evident via _____.
    A) Hyperconnectivity; synaptic pruning
    B) Cell death; synaptic pruning
    C) Hyperconnectivity; plasticity
    D) Cell death; synesthesia

154. The frontal area of the cortex approaches maturity:
    A) at birth.
    B) when the gray matter has fully replaced the white matter.
    C) in early adulthood.
    D) when synapse generation outpaces synapse elimination.

155. The capacity of the brain to be shaped by experience is referred to as:
    A) neurogenesis.
    B) myelination.
    C) synaptic pruning.
    D) plasticity.

156. Which factor plays a central role in determining which of the brain's synapses will be eliminated and which will be maintained?
    A) the frequency with which they are activated
    B) sensitive periods
    C) their genetic potential
    D) random variability

157. The process by which the brain's excess synapses are pruned has been dubbed neural:
    A) Darwinism.
    B) Scarrism.
    C) Watsonism.
    D) Mendelianism.

158. Experience-_____ plasticity relies on normal human experience for normal brain development.
    A) dependent
    B) independent
    C) expectant
    D) protected

159. Imagine an infant who is given special glasses to wear from birth. The glasses do not allow the infant to see any colour; rather, the world appears to the infant in shades of gray. The child's brain development would probably be affected through experience-_____ processes.
    A) protected
    B) expectant
    C) dependent
    D) independent

160. Which statement is an example of experience-expectant processes?
    A) Individuals are able to remember the details of a magazine article after they have read it.
    B) Children who are born with cataracts that are not removed early enough will have permanently impaired vision.
    C) Rats that are trained to use just one limb to get a food reward have increased dendritic material in the particular area of the motor cortex that controls the movement of that limb.
    D) All of these statements are examples of experience-expectant processes.

161. When an expected form of sensory input is absent, the areas of the brain that normally would have become specialized as a result of that experience typically:
    A) die off.
    B) can be reorganized to serve another function.
    C) interfere with other areas of the brain that are serving related functions.
    D) continue to strengthen their synapses until some low level of the sensory input can be perceived.

162. Consider the following statements. Statement A: Congenitally blind individuals show activation of the visual cortex when reading Braille. Statement B: Deaf individuals' responses to peripheral visual stimuli are several times stronger than those of hearing people. Which statement represents evidence of the ability of the human brain to reorganize when an expected form of sensory experience is absent?
    A) statement A only
    B) statement B only
    C) both statements A and B
    D) neither statement A nor statement B

163. Deaf individuals' responses to peripheral visual stimuli are evidence of:
    A) a sensitive period.
    B) experience-dependent plasticity.
    C) experience-expectant plasticity.
    D) myelination.

164. The superior ability to discriminate changes in musical pitch of adults who were born blind is evidence of:
    A) a sensitive period.
    B) experience-dependent plasticity.
    C) experience-expectant plasticity.
    D) myelination.

165. Cole was born with nonfunctioning hands and must use his feet for most tasks that are typically done with one's hands. Considering experience-expectant plasticity, the MOST likely thing that will happen to the area of Cole's cortex that would normally process sensory information from the hands is that the area will:
    A) reorganize to process sensory information from his feet.
    B) atrophy as a result of synaptic pruning.
    C) interfere with the functioning of nearby areas of the brain.
    D) disintermediate.

166. Times when the human brain is in particular need of external experience to develop normally are referred to as:
    A) experience-dependent plasticity phases.
    B) sensitive periods.
    C) cycles of vulnerability.
    D) critical moments.

167. Sensitive periods are relevant to experience-_____ plasticity.
    A) dependent
    B) independent
    C) expectant
    D) protected

168. Experience-_____ plasticity allows an individual's personal experiences to shape brain development.
    A) dependent
    B) independent
    C) expectant
    D) protected

169. Which factor is NOT a component of experience-dependent plasticity?
    A) more synapses per neuron
    B) increased dendritic spines on cortical neurons
    C) thicker cortex
    D) sensitive periods

170. Michael and Scott are identical twin 7-year-old boys. Michael spends a great deal of time learning to master the game of chess while Scott plays tennis, golf, and baseball. Michael's and Scott's neural connections will develop differently through experience-_____ processes.
    A) expectant
    B) protected
    C) independent
    D) dependent

171. Which example does NOT illustrate experience-dependent plasticity?
    A) the increased activity in left-brain areas for children with dyslexia who were given extra training in sounds and letters
    B) the enlarged cortical representation of the left hand for Braille readers
    C) the extra dendritic spines on the cortical neurons of monkeys reared in a complex environment
    D) the activation in the visual cortex of congenitally blind individuals when reading Braille

172. Children who suffer brain damage:
    A) tend to experience a shift in the area in which a particular brain function is located.
    B) can always make a complete and long-term recovery.
    C) suffer long-term consequences only if they are particularly genetically vulnerable to synapse elimination.
    D) All of the answers are correct.

173. Young children who suffer damage to the language area of the cortex generally:
    A) recover to a greater extent than do adults who suffer the same damage.
    B) recover to a lesser extent than do adults who suffer the same damage.
    C) recover to an extent equal to that of adults who suffer the same damage.
    D) fail to recover.

174. Younger people can generally recover from brain damage to a greater extent than can adults because of:
    A) plasticity and timing.
    B) plasticity and experience.
    C) timing and experience.
    D) reorganization and experience.

175. During which time is brain damage LEAST likely to lead to permanent deficiencies?
    A) prenatal development
    B) the first year of life
    C) early childhood
    D) adulthood

176. Kim is a 4-year-old who has just been in an accident and has sustained damage to an area of the brain that is specialized for a particular skill. Her doctor tells her parents that she is lucky to be so young; she should recover her ability in this domain. Her doctor is counting on Kim's brain to:
    A) create new neurons to replace the damaged ones.
    B) become rewired as a different area takes over for the damaged area.
    C) regenerate brain tissue.
    D) direct her skeletal and muscular system to work harder at the skill.

177. A cross-sectional study of children who were born with cerebral damage and a control group of children with no brain damage demonstrated that:
    A) the two groups showed no differences in IQ.
    B) the two groups showed no differences in IQ at the age of 6 years, but the group with brain damage had lower average IQ at older ages.
    C) the group with brain damage had lower average IQ at the age of 6 years, but the groups showed no differences at older ages.
    D) the two groups showed no differences in IQ through puberty, but the group with brain damage had lower average IQ at older ages.

178. Plasticity is highest and thus recovery from brain damage is MOST likely when _____ is occurring.
    A) neuron migration
    B) neurogenesis
    C) cell differentiation
    D) synaptic pruning

179. Which statement about physical growth is TRUE?
    A) Physical growth is quite regular over time.
    B) Humans grow for a smaller proportion of their life span than other species.
    C) Growth tends to be even across different parts of the body.
    D) Growth is uneven over time.

180. In adolescence, the proportion of body fat:
    A) increases in both boys and girls.
    B) decreases in both boys and girls.
    C) increases in boys and decreases in girls.
    D) decreases in boys and increases in girls.

181. Which item is NOT a source of variability in physical development among individuals?
    A) genes
    B) nutrition
    C) chronic stress
    D) body image

182. Marked changes in physical development that have occurred over generations are referred to as:
    A) historical anomalies.
    B) generation-dependent plasticity.
    C) secular trends.
    D) growth disturbances.

183. Which statement is an example of a secular trend?
    A) African American children mature more quickly than do their European American peers.
    B) Females generally reach puberty before their male peers do.
    C) The average child growing up in North Korea is several inches shorter than is the average child growing up in North America.
    D) Northern American adults are several inches taller than their same-sex great-grandparents were.

184. Which occurrence is NOT likely to be due to environmental factors?
    A) Females generally reach puberty before their male peers.
    B) In contemporary industrialized nations, adults are several inches taller than their same-sex great-grandparents were.
    C) North American girls today tend to begin menstruating a few years earlier than did their ancestors.
    D) None of the occurrences is due to environmental factors.

185. Which type of factor is involved in failure to thrive?
    A) genetic factors only
    B) environmental factors only
    C) both genetic and environmental factors
    D) neither genetic nor environmental factors

186. Which statement about human mothers' milk is NOT true?
    A) It contains beneficial bacteria.
    B) It contains fatty acids that have a positive effect on IQ.
    C) It contains the mother's antibodies.
    D) It is nutritionally superior to formula.

187. Results of a study that randomly assigned mother–infant dyads either to an intervention encouraging breastfeeding or to a control condition without intervention indicated all of the following EXCEPT:
    A) it is difficult to encourage mothers to breastfeed.
    B) any relation between breastfeeding and cognitive development can be accounted for by social class.
    C) only infants with a specific allele that regulates fatty acids show benefits from being breastfed.
    D) there are no well-established nutritional superiority of breast milk.

188. In 2012, what percentage of newborns in Canada were fed breast milk?
    A) 25.5
    B) 47.2
    C) 67.3
    D) 89.0

189. Which statement does NOT describe a problem associated with the use of formula for infant feeding in underdeveloped countries?
    A) The formula is often mixed with polluted water.
    B) The formula does not contain antibodies against infections.
    C) The formula is frequently diluted because of high cost.
    D) Mothers in underdeveloped countries are more likely to use formula for infant feeding.

190. Infant taste preferences:
    A) are innate.
    B) are learned in the first few weeks of life.
    C) differ from adult taste preferences.
    D) most likely do not have an evolutionary origin.

191. Parents who reward their children with sweets for eating vegetables are likely to be influencing their children to:
    A) dislike vegetables even more but also come to dislike sweet, fatty foods.
    B) prefer vegetables over sweet, fatty foods.
    C) develop a strong preference for both vegetables and sweet, fatty foods.
    D) dislike vegetables even more and have a stronger preference for sweet, fatty foods.

192. Kevin and Rita are concerned that their 3-year-old son James sometimes eats what appears to be too little and sometimes eats what appears to be too much. They should:
    A) allow James to have complete control over the types of food he eats.
    B) punish James for not finishing all the food on his plate.
    C) alter the home environment in ways that promote positive health outcomes for James.
    D) reward James with foods he likes, such as cookies, for eating nutritious foods.

193. Which statement regarding children whose parents overregulate their eating behaviour is TRUE?
    A) They are less likely to struggle with their weight as adults.
    B) They are better at regulating their own food intake.
    C) They are less likely to struggle with their weight as adults and are better at regulating their own food intake.
    D) They are more likely to have a larger BMI and other risk factors for adult obesity.

194. In the past 40 years, the proportion of Canadian children and adolescents who are overweight has:
    A) stabilized.
    B) doubled.
    C) increased.
    D) decreased.

195. The weight of adopted children is:
    A) more strongly related to the weight of their adoptive parents than to the weight of their biological parents.
    B) more strongly related to the weight of their biological parents than to the weight of their adoptive parents.
    C) unrelated to either the weight of their biological parents or the weight of their adoptive parents.
    D) equally related to the weight of their biological and adoptive parents.

196. Which factor does NOT contribute to obesity?
    A) activity level
    B) TV-viewing habits
    C) speed of eating
    D) healthy nutrition

197. Which factor is NOT associated with obesity?
    A) social isolation
    B) ethnicity
    C) diabetes
    D) adequate sleep

198. Undernutrition and malnutrition are almost always associated with:
    A) poverty.
    B) teenage mothers.
    C) drug abuse and alcoholism.
    D) all of these.

199. Which condition is NOT an effect of malnutrition?
    A) delayed intellectual development
    B) lethargy and withdrawal
    C) brain damage
    D) increased hyperactivity

200. Which condition is a direct effect of malnutrition?
    A) brain damage
    B) poverty
    C) delayed intellectual development
    D) decreased expectations of child from adults

201. Which infant is at an increased risk of SIDS?
    A) Brandon, who is Latino
    B) Stacey, whose parents are of high SES
    C) Samantha, who is Asian
    D) Marcus, whose parents are of low SES

202. Which infant is at an increased risk for delayed or slowed brain growth?
    A) Gerardo, who is Latino and whose parents are middle-class
    B) Bree, who is Caucasian and whose parents are of high SES
    C) Ami, who is Asian and whose parents are middle-class
    D) Juan, who is Latino and whose parents are of low SES.

203. Which factor is NOT a possible reason of smaller brain size among infants from low SES families?
    A) the level of stress in the home
    B) environmental toxins
    C) prenatal nutrition
    D) a richness-deprived environment

204. Children living in poverty are not necessarily at a heightened risk for:
    A) overweight or obesity.
    B) schizophrenia.
    C) cardiovascular disease.
    D) psychiatric illness.

Answer Key

1. A
2. B
3. B
4. A
5. A
6. D
7. A
8. C
9. C
10. A
11. A
12. C
13. A
14. A
15. A
16. B
17. B
18. A
19. D
20. A
21. C
22. B
23. D
24. B
25. B
26. D
27. A
28. C
29. B
30. B
31. C
32. B
33. D
34. C
35. B
36. A
37. B
38. C
39. B
40. A
41. B
42. A
43. D
44. D

45. C
46. D
47. D
48. B
49. A
50. C
51. B
52. D
53. A
54. B
55. D
56. A
57. C
58. D
59. B
60. C
61. C
62. D
63. D
64. D
65. A
66. C
67. A
68. A
69. A
70. D
71. A
72. C
73. A
74. B
75. A
76. A
77. C
78. C
79. C
80. B
81. C
82. D
83. B
84. A
85. A
86. C
87. A
88. B
89. A
90. A

91. D
92. C
93. A
94. C
95. A
96. D
97. C
98. A
99. B
100. B
101. A
102. B
103. D
104. D
105. A
106. C
107. A
108. B
109. C
110. D
111. B
112. B
113. B
114. C
115. C
116. B
117. A
118. C
119. C
120. D
121. D
122. A
123. B
124. A
125. B
126. A
127. C
128. D
129. B
130. A
131. C
132. C
133. D
134. B
135. D
136. B

137. A
138. C
139. A
140. C
141. D
142. B
143. D
144. C
145. C
146. B
147. D
148. C
149. C
150. A
151. D
152. A
153. B
154. C
155. D
156. A
157. A
158. C
159. B
160. B
161. B
162. C
163. C
164. C
165. A
166. B
167. C
168. A
169. D
170. D
171. D
172. A
173. A
174. A
175. C
176. B
177. B
178. D
179. D
180. D
181. D
182. C

183. D
184. A
185. C
186. A
187. D
188. D
189. D
190. A
191. D
192. C
193. D
194. C
195. B
196. D
197. D
198. A
199. D
200. B
201. D
202. D
203. C
204. B

1. Provide a detailed description of how an individual's sex is determined. Be sure to explain the determination from the moment of conception to the “moulding” of maleness or femaleness.

2. Describe three mechanisms for genetic diversity, and give examples of each mechanism. Discuss how these processes can result in beneficial genetic outcomes, as well as how they can also produce disease and disorders.

3. Jake's biological father has hazel eyes, and Jake's biological mother has green eyes. Jake has brown eyes. Describe the concepts of the dominant–recessive pattern of inheritance and polygenic inheritance, and explain how Jake might have inherited brown eyes.

4. Describe the concept of norm of reaction. Give an example of a genotype and how its interaction with different environments might affect the phenotype that results.

5. Lenny is a very active toddler who began to crawl, pull himself up to a standing position, walk, climb, and run at a very early age. Describe the two general ways in which a child's phenotype “creates” his or her environment. Then provide specific examples of how Lenny may actively create his environment.

6. Describe the components of the neuron and explain how neurons transfer information to one another.

7. Describe the types of brain plasticity.

8. Describe three environmental factors that play a role in obesity in Canada.

Answer Key

1. An individual's sex is determined by the sex chromosomes. Females have two identical chromosomes, XX. Males have one X chromosome and one smaller Y chromosome. Because a female has only X chromosomes, the division of her gametes results in all her eggs having an X. Males, however, are XY resulting in half of his sperm containing an X chromosome and the other half containing a Y chromosome. Therefore, it is the father who determines the sex of the baby. It is the presence of a Y chromosome that makes a fetus male. A gene on the Y chromosome encodes the protein that triggers the prenatal formation of testes by activating genes on other chromosomes. The testes then produce the hormone testosterone.
2. Several mechanisms contribute to genetic diversity among people. One such mechanism is mutation, a change that occurs in a section of DNA. Some mutations are random, while others are caused by environmental factors. Unfortunately, most mutations are harmful. Those that occur in germ cells can be passed on to offspring; many inherited diseases and disorders originate from a mutated gene. Occasionally, however, a mutation makes individuals more viable by increasing their resistance to some disease or by increasing their ability to adapt to an important environment component. A second mechanism that promotes variability among individuals is the random assortment of chromosomes in the formation of egg and sperm. During gamete division, the 23 pairs of chromosomes are shuffled randomly. When a sperm and an egg unite, the odds are zero that any two individuals would have the same genotype. A third mechanism that aids variability is a process called crossing over. When gametes divide, the two members of a pair of chromosomes sometimes swap sections of DNA. Thus, some of the chromosomes that parents pass on to their offspring are constituted differently from their own.
3. Many of an individual's genes are never expressed; some others are only partially expressed. This is because one-third of human genes have two or more different forms, or alleles. The alleles of a given gene influence the same trait or characteristic, but they contribute to different developmental outcomes. Per the dominant–recessive pattern of inheritance, some genes have only two alleles, one of which is dominant and the other recessive. In this pattern, there are two possibilities: a person can inherit two of the same allele or the person can inherit two different alleles. When an individual is homozygous, with either two dominant or two recessive alleles, the corresponding trait will be expressed. When an individual is heterozygous for a trait, the instructions of the dominant allele will be expressed. So, for Jake, both of his parents had to possess the recessive allele for brown eyes, resulting in Jake having brown eyes. Polygenic inheritance, on the other hand, occurs when many different genes contribute to any given phenotypic outcome. In this instance, a single gene can affect multiple traits; both alleles can be fully expressed or blended in heterozygous individuals; and some genes are expressed differently, depending on whether they are inherited from the mother or from the father. Taking this perspective of inheritance, it could be that Jake has brown eyes because of the genes from both of his parents blending together.
4. Because of the continuous interaction of genotype and environment, a given genotype will develop differently in different environments. This idea is expressed by the concept of the norm of reaction, which refers to all the phenotypes that could theoretically result

from a given genotype in relation to all the environments in which it could survive and develop. Per this concept, for any given genotype developing in varying environments, a range of outcomes would be possible. One example of this is phenylketonuria (PKU). PKU is a disorder related to a defective recessive gene on chromosome 12. Individuals who inherit this gene from both parents cannot metabolize phenylalanine, an amino acid present in many foods (especially red meats) and in artificial sweeteners. If they eat a normal diet, phenylalanine accumulates in the bloodstream, causing impaired brain development that results in severe intellectual impairment. However, if infants with the PKU gene are identified shortly after birth and placed on a stringent diet free of phenylalanine, intellectual impairment can be avoided, if the diet is carefully maintained.

5. Children are active creators of the environment in which they live in two important ways. First, by their nature and behaviour, they actively evoke certain kinds of responses from others. If Lenny is an outgoing infant and toddler, he will encourage others in his environment to attend to him by his smiles and giggles and other friendly and welcoming reactions to others. The second way in which children create their own environment is by actively selecting surroundings and experiences that match their interests, talents, and personality characteristics. Since Lenny is very active and began exploring his environment early, he will selectively attune to objects in his environment for exploration, rather than depending on his parents for entertainment.
6. Neurons constitute the grey matter of the brain. These cells are specialized for sending and receiving messages between the brain and all parts of the body, as well as within the brain itself. Sensory neurons transmit information from sensory receptors that detect stimuli in the external environment or within the body. Motor neurons transmit information from the brain to muscles and glands; and interneurons act as intermediaries between sensory and motor neurons. All neurons are made up of three main components: (1) a cell body, which contains the basic biological material that keeps the neuron functioning; (2) dendrites, fibres that receive input from other cells and conduct it toward the cell body in the form of electrical impulses; and (3) an axon, a fibre that conducts electrical signals away from the cell body to connections with other neurons. Neurons communicate with one another at synapses, which are microscopic junctions between the axon terminal of one neuron and the dendritic branches of another. In this communication process, electrical and chemical messages cross the synapses and cause the receiving neurons either to fire, sending a signal on to other neurons, or to be inhibited from firing.
7. Plasticity is the capacity of the brain to be moulded or changed by experience. There are two different kinds of plasticity. One kind involves the general experiences that almost all infants have just by being human. This form of plasticity is referred to as experience-expectant. The second kind, referred to as experience dependent, involves specific, idiosyncratic experiences that children have because of their life circumstances, such as growing up in Canada, experiencing frequent cuddling or abuse, or being an only child or one of many siblings.
8. Environmental influences play a major role in obesity in Canada. This is evident from the fact that a much higher proportion of the Canadian population is overweight now than in previous times. A host of other factors are involved as well. At school, children often purchase cafeteria lunches consisting of high-fat foods and high-calorie soft

drinks. They also spend less time playing outside. Children also get less exercise because they rarely walk or bike to school. At the same time, children spend increasingly more hours per day in front of screens, which is more highly predictive of obesity than amount of physical activity.