Chapter 02: Test Bank
Biological and Environmental Foundations

Multiple Choice

1. In each human cell, a nucleus contains _____ chromosomes.
a. 12
b. 12 matching pairs of
c. 23
d. 23 matching pairs of
Ans: d
Learning Objective: 2.1
Cognitive Domain: Knowledge
Answer Location: The Genetic Code
Question Type: MC

2. The human nucleus contains 23 matching pairs of rod-shaped structures called _____.
a. genomes
b. DNA
c. chromosomes
d. zygotes
Ans: c
Learning Objective: 2.1
Cognitive Domain: Knowledge
Answer Location: The Genetic Code
Question Type: MC

3. Genes are composed of stretches of _____, a complex molecule shaped like a twisted ladder or staircase.
a. deoxyribonucleic acid (DNA)
b. gametes
c. zygotes
d. nuclei
Ans: a
Learning Objective: 2.1
Cognitive Domain: Knowledge
Answer Location: The Genetic Code
Question Type: MC

4. Genes are:
a. rod-shaped structures located in each human nucleus.
b. the blueprint for creating all of the traits that organisms carry.
c. sex cells that combine to create a unique individual.
d. identical molecules for every existing species on earth.
Ans: b
Learning Objective: 2.1
Cognitive Domain: Comprehension
Answer Location: The Genetic Code
Question Type: MC

5. Researchers have estimated that _____ to _____ genes reside within the chromosomes and influence all genetic characteristics.
a. 10,000; 15,000

b. 20,000; 25,000
c. 50,000; 70,000
d. 100,000; 200,000
Ans: b
Learning Objective: 2.1
Cognitive Domain: Comprehension
Answer Location: The Genetic Code
Question Type: MC

6. The ____ is the set of instructions to construct a living organism.
a. zygote
b. nucleus
c. genome
d. gamete
Ans: c
Learning Objective: 2.1
Cognitive Domain: Knowledge
Answer Location: The Genetic Code
Question Type: MC

7. As a human, you share ___ percent of your DNA with our closest genetic relative, the chimpanzee.
a. 10
b. 25
c. 68
d. 99
Ans: d
Learning Objective: 2.1
Cognitive Domain: Application
Answer Location: The Genetic Code
Question Type: MC

8. Lu is from Korea and Pedro is from Ecuador. Lu and Pedro share ____ percent of their genes.
a. 15.7
b. 25.8
c. 44.2
d. 99.7
Ans: d
Learning Objective: 2.1
Cognitive Domain: Application
Answer Location: The Genetic Code
Question Type: MC

9. _____ is the process of cell division during which DNA replicates itself.
a. Mitosis
b. Meiosis
c. Fertilization
d. Cellular mutation
Ans: a
Learning Objective: 2.2
Cognitive Domain: Knowledge
Answer Location: Cell Reproduction
Question Type: MC

10. Mitosis ultimately enables humans to:
a. reproduce and pass on their genetic material.

b. develop from a single fertilized egg into a child, adolescent, and eventually, an adult.
c. develop into either a male or a female.
d. establish a unique genetic blueprint for development.
Ans: b
Learning Objective: 2.2
Cognitive Domain: Comprehension
Answer Location: Cell Reproduction
Question Type: MC

11. Sex cells produce _____.
a. DNA
b. chromosomes
c. gametes
d. the genome
Ans: c
Learning Objective: 2.2
Cognitive Domain: Knowledge
Answer Location: Cell Reproduction
Question Type: MC

12. Gametes reproduce through _____.
a. mitosis
b. meiosis
c. fertilization
d. dominant-recessive inheritance
Ans: b
Learning Objective: 2.2
Cognitive Domain: Comprehension
Answer Location: Cell Reproduction
Question Type: MC

13. A(n) ____ is a fertilized egg.
a. chromosome
b. gamete
c. allele
d. zygote
Ans: d
Learning Objective: 2.2
Cognitive Domain: Knowledge
Answer Location: Cell Reproduction
Question Type: MC

14. A human zygote contains ____ chromosomes from the biological mother and ____ chromosomes from the biological father.
a. 10; 20
b. 23; 46
c. 23; 23
d. 46; 46
Ans: c
Learning Objective: 2.2
Cognitive Domain: Knowledge
Answer Location: Cell Reproduction
Question Type: MC

15. In humans, ___ of the 23 pairs of chromosomes are matched and contain similar genes in almost identical positions and sequence.
a. 5
b. 14
c. 20
d. 22
Ans: d
Learning Objective: 2.2
Cognitive Domain: Knowledge
Answer Location: Sex Determination
Question Type: MC

16. The 23rd pair of chromosomes specify the _____ of the individual.
a. DNA
b. biological sex
c. intelligence
d. personality
Ans: b
Learning Objective: 2.2
Cognitive Domain: Comprehension
Answer Location: Sex Determination
Question Type: MC

17. Child A has two large X-shaped chromosomes (XX), and Child B has one large X-shaped chromosome and one much smaller Y-shaped chromosome (XY). Child A is _____ and Child B is ____.
a. female; male
b. male; female
c. an identical twin; a fraternal twin
d. a fraternal twin; an identical twin
Ans: a
Learning Objective: 2.2
Cognitive Domain: Application
Answer Location: Sex Determination
Question Type: MC

18. The _____ contains genetic instructions that will cause the fetus to develop male reproductive organs.
a. X chromosome
b. Y chromosome
c. gamete
d. nucleus
Ans: b
Learning Objective: 2.2
Cognitive Domain: Knowledge
Answer Location: Sex Determination
Question Type: MC

19. If an ovum is fertilized by a(n) ____ sperm, a male fetus will develop. If an ovum is fertilized by a(n) ____ sperm, a female fetus will form.
a. Y; X
b. X; Y
c. XY; XX
d. XX; XY
Ans: a

Learning Objective: 2.2
Cognitive Domain: Knowledge
Answer Location: Sex Determination
Question Type: MC

20. A process called _____ enables couples with a family history of diseases carried on the sex chromosomes to have a healthy baby of the sex unaffected by the disease they carry.
a. sex selection
b. gender modification
c. gene therapy
d. surrogacy
Ans: a
Learning Objective: 2.2
Cognitive Domain: Comprehension
Answer Location: Box 2.1: Ethical and Policy Applications of Lifespan Development: Prenatal Sex Selection
Question Type: MC

21. Preconception sperm sorting and pre-implantation genetic diagnosis are two methods of _____.
a. surrogacy
b. gene therapy
c. gender modification
d. sex selection
Ans: D
Learning Objective: 2.2
Cognitive Domain: Comprehension
Answer Location: Box 2.1: Ethical and Policy Applications of Lifespan Development: Prenatal Sex Selection
Question Type: MC

22. _____ increases genetic variability and accounts for genetic uniqueness.
a. Mitosis
b. Meiosis
c. Sexual selection
d. Fertilization
Ans: b
Learning Objective: 2.3
Cognitive Domain: Comprehension
Answer Location: Genes Shared by Twins
Question Type: MC

23. Shannon and Frankie just found out that they are pregnant. They are interested in the odds of having twins. You can tell them that twins occur in about 1 out of every ____ births in the United States.
a. 10
b. 20
c. 30
d. 40
Ans: c
Learning Objective: 2.3
Cognitive Domain: Application
Answer Location: Genes Shared by Twins
Question Type: MC

24. ____ are conceived when a woman releases more than one ovum and each is fertilized by a different sperm.
a. Dizygotic twins
b. Conjoined twins
c. Triplets
d. Monozygotic twins
Ans: a
Learning Objective: 2.3
Cognitive Domain: Comprehension
Answer Location: Genes Shared by Twins
Question Type: MC

25. Dizygotic twins:
a. are also known as identical twins.
b. share about one half of their genes.
c. are more similar to each other than ordinary siblings.
d. occur less frequently than monozygotic twins.
Ans: b
Learning Objective: 2.3
Cognitive Domain: Comprehension
Answer Location: Genes Shared by Twins
Question Type: MC

26. In about ____ of fraternal twin pairs, one twin is a boy and other is a girl.
a. 10 percent
b. one third
c. half
d. 80 percent
Ans: c
Learning Objective: 2.3
Cognitive Domain: Knowledge
Answer Location: Genes Shared by Twins
Question Type: MC

27. Which of the following factors increases the likelihood of having twins?
a. Being underweight
b. One or both parents of Asian ancestry
c. Older maternal age
d. High carb diet
Ans: c
Learning Objective: 2.3
Cognitive Domain: Comprehension
Answer Location: Genes Shared by Twins
Question Type: MC

28. ____ twins originate from the same zygote.
a. Monozygotic
b. Dizygotic
c. Male
d. Female
Ans: a
Learning Objective: 2.3
Cognitive Domain: Knowledge
Answer Location: Genes Shared by Twins
Question Type: MC

29. Identical twins occur in ____ of every 1,000 U.S. births.
a. 4
b. 17
c. 23
d. 35
Ans: a
Learning Objective: 2.3
Cognitive Domain: Knowledge
Answer Location: Genes Shared by Twins
Question Type: MC

30. Chase and Carson share the same genotype, with identical instructions for all physical and psychological characteristics. Chase and Carson:
a. are dizygotic twins.
b. are monozygotic twins.
c. each have two large X-shaped chromosomes.
d. each have two small Y-shaped chromosomes.
Ans: b
Learning Objective: 2.3
Cognitive Domain: Application
Answer Location: Genes Shared by Twins
Question Type: MC

31. The genes within each chromosome can be expressed in different forms, or _____, that influence a variety of physical characteristics.
a. zygotes
b. nuclei
c. gametes
d. alleles
Ans: d
Learning Objective: 2.4
Cognitive Domain: Knowledge
Answer Location: Dominant-Recessive Inheritance
Question Type: MC

32. Maddox and Maecy both carry alleles for brown hair. Their 4-year-old son, Drake, also has brown hair. Therefore, Drake is _____ the trait of brown hair.
a. homozygous for
b. heterozygous for
c. a carrier of
d. recessive for
Ans: a
Learning Objective: 2.4
Cognitive Domain: Application
Answer Location: Dominant-Recessive Inheritance
Question Type: MC

33. When alleles of the pair of chromosomes are different, the person is _____ and the trait expressed will depend on the relations among the genes.
a. homozygous
b. heterozygous
c. dominant
d. polygenic
Ans: b

Learning Objective: 2.4
Cognitive Domain: Knowledge
Answer Location: Dominant-Recessive Inheritance
Question Type: MC

34. Some genes are passed through _____, in which some genes are always expressed, regardless of the gene they are paired with other. Others will only be expressed if paired with another recessive gene.
a. dominant-recessive inheritance
b. incomplete dominance
c. polygenic inheritance
d. genomic imprinting
Ans: a
Learning Objective: 2.4
Cognitive Domain: Comprehension
Answer Location: Dominant-Recessive Inheritance
Question Type: MC

35. When an individual is heterozygous for a particular trait, the dominant gene is expressed and the person becomes _____ the recessive gene.
a. codominant for
b. an allele for
c. a carrier of
d. a producer of
Ans: c
Learning Objective: 2.4
Cognitive Domain: Knowledge
Answer Location: Dominant-Recessive Inheritance
Question Type: MC

36. Xavier has dark curly hair and facial dimples. These characteristics are called _____ traits.
a. recessive
b. dominant
c. polygenic
d. codominant
Ans: b
Learning Objective: 2.4
Cognitive Domain: Application
Answer Location: Dominant-Recessive Inheritance
Question Type: MC

37. Tonya has straight red hair, blue eyes, and her big toe is longer than her second toe. These characteristics are called _____ traits.
a. recessive
b. dominant
c. polygenic
d. codominant
Ans: a
Learning Objective: 2.4
Cognitive Domain: Application
Answer Location: Dominant-Recessive Inheritance
Question Type: MC

38. _____ is a genetic inheritance pattern in which both genes influence the characteristic.
a. Dominant-recessive inheritance

b. Polygenic inheritance
c. Incomplete dominance
d. Genomic imprinting
Ans: c
Learning Objective: 2.4
Cognitive Domain: Knowledge
Answer Location: Incomplete Dominance
Question Type: MC

39. Approximately 8 percent of African Americans carry the recessive sickle cell trait. However, sickle cell carriers do not develop full-blown sickle cell anemia. In fact, they may function normally but show some symptoms, such as reduced oxygen distribution throughout the body and exhaustion after exercise. This illustrates the _____ genetic inheritance pattern.
a. dominant-recessive
b. incomplete dominance
c. polygenic
d. mutated
Ans: b
Learning Objective: 2.4
Cognitive Domain: Comprehension
Answer Location: Incomplete Dominance
Question Type: MC

40. Which of the following traits reflect polygenic inheritance?
a. sickle cell anemia
b. facial dimples
c. baldness
d. intelligence
Ans: d
Learning Objective: 2.4
Cognitive Domain: Comprehension
Answer Location: Polygenic Inheritance
Question Type: MC

41. Most traits are a function of the interaction of multiple genes, known as _____.
a. polygenic inheritance
b. incomplete dominance
c. dominant-recessive inheritance
d. genomic imprinting
Ans: a
Learning Objective: 2.4
Cognitive Domain: Knowledge
Answer Location: Polygenic Inheritance
Question Type: MC

42. Instances in which the expression of a gene is determined by whether it is inherited from the mother or the father is called _____.
a. polygenic inheritance
b. incomplete dominance
c. dominant-recessive inheritance
d. genomic imprinting
Ans: d
Learning Objective: 2.4
Cognitive Domain: Knowledge

Answer Location: Genomic Imprinting
Question Type: MC

43. Emily has Prader-Willi syndrome, a disorder that is characterized by obesity, insatiable hunger, short stature, motor slowness, and mild to moderate intellectual impairment. According to the concept of genomic imprinting, Emily inherited this disorder from her _____.
a. mother
b. father
c. maternal grandmother
d. paternal grandfather
Ans: b
Learning Objective: 2.4
Cognitive Domain: Application
Answer Location: Genomic Imprinting
Question Type: MC

44. Prader-Willi and Angelman syndromes illustrate the concept of _____.
a. polygenic inheritance
b. genomic imprinting
c. dominant-recessive inheritance
d. incomplete dominance
Ans: b
Learning Objective: 2.4
Cognitive Domain: Comprehension
Answer Location: Genomic Imprinting
Question Type: MC

45. Which of the following diseases/disorders is an example of dominant-recessive inheritance?
a. Prader-Willi syndrome
b. Down syndrome
c. Autism
d. Cystic fibrosis
Ans: d
Learning Objective: 2.5
Cognitive Domain: Comprehension
Answer Location: Genetic Disorders
Question Type: MC

46. Levi has a fatal disease that causes the central nervous system to deteriorate, leading to significant declines in muscle coordination and cognition. He was unaware that he had the disease until his late-30s because he did not experience any symptoms in childhood, adolescence, or young adulthood. Levi has _____.
a. cystic fibrosis
b. Marfan syndrome
c. Huntington's disease
d. PKU
Ans: c
Learning Objective: 2.5
Cognitive Domain: Application
Answer Location: Genetic Disorders
Question Type: MC

47. One of the most common recessive disorders is _____, which is diagnosed in about 1 of every 15,000 newborns.
a. cystic fibrosis

b. Marfan syndrome
c. Huntington's disease
d. PKU
Ans: d
Learning Objective: 2.5
Cognitive Domain: Knowledge
Answer Location: Genetic Disorders
Question Type: MC

48. _____ is a recessive disease that primarily affects descendants of Central and Eastern European Jews. There is no cure for this disease and most die by age 4.
a. Tay-Sachs disease
b. Cooley's anemia
c. Sickle cell anemia
d. Huntington's Disease
Ans: a
Learning Objective: 2.5
Cognitive Domain: Knowledge
Answer Location: Genetic Disorders
Question Type: MC

49. Daughters who inherit the gene for hemophilia:
a. usually die from the disease before the age of 20.
b. demonstrate more severe symptoms than sons who inherit the gene.
c. typically do not show the disorder.
d. have an 80 percent chance of transmitting the gene to their offspring.
Ans: c
Learning Objective: 2.5
Cognitive Domain: Comprehension
Answer Location: Genetic Disorders
Question Type: MC

50. Which of the following statements about fragile X syndrome is true?
a. It only affects males.
b. It only affects females.
c. It occurs in about 1 in every 3,000 U.S. births.
d. It occurs in both males and females.
Ans: d
Learning Objective: 2.5
Cognitive Domain: Comprehension
Answer Location: Genetic Disorders
Question Type: MC

51. Some research suggests that fragile X syndrome is strongly associated with ____.
a. autism
b. ADHD
c. Huntington's disease
d. PKU
Ans: a
Learning Objective: 2.5
Cognitive Domain: Comprehension
Answer Location: Genetic Disorders
Question Type: MC

52. About 1 in ____ males are affected by color blindness.

a. 5
b. 12
c. 70
d. 100
Ans: b
Learning Objective: 2.5
Cognitive Domain: Knowledge
Answer Location: Genetic Disorders
Question Type: MC

53. Kevin suffers from the most widely known chromosome disorder. Kevin has ____ syndrome.
a. Prader-Willi
b. Klinefelter
c. Down
d. triple X
Ans: c
Learning Objective: 2.6
Cognitive Domain: Application
Answer Location: Chromosomal Abnormalities
Question Type: MC

54. Down syndrome occurs in approximately 1 out of every ____ births.
a. 500
b. 700
c. 1200
d. 1500
Ans: b
Learning Objective: 2.6
Cognitive Domain: Knowledge
Answer Location: Chromosomal Abnormalities
Question Type: MC

55. Down syndrome is also called _____.
a. fragile X syndrome
b. trisomy 21
c. Klinefelter syndrome
d. trisomy 15
Ans: b
Learning Objective: 2.6
Cognitive Domain: Knowledge
Answer Location: Chromosomal Abnormalities
Question Type: MC

56. _____ is the most common genetic cause of mental retardation.
a. Fragile X syndrome
b. PKU
c. Tay-Sachs disease
d. Down syndrome
Ans: d
Learning Objective: 2.6
Cognitive Domain: Comprehension
Answer Location: Chromosomal Abnormalities
Question Type: MC

57. Today, the average life expectancy of individuals with Down syndrome is ____.

a. 25
b. 40
c. 60
d. 75
Ans: c
Learning Objective: 2.6
Cognitive Domain: Comprehension
Answer Location: Chromosomal Abnormalities
Question Type: MC

58. Trenton, age 50, has Down syndrome. Compared to unaffected adults his age, Trenton is at greater risk for developing _____.
a. Huntington's disease
b. Alzheimer's disease
c. Cooley's anemia
d. Cystic fibrosis
Ans: b
Learning Objective: 2.6
Cognitive Domain: Application
Answer Location: Chromosomal Abnormalities
Question Type: MC

59. Some of the most common chromosomal abnormalities affect the _____ pair of chromosomes.
a. 9th
b. 15th
c. 21st
d. 23rd
Ans: d
Learning Objective: 2.6
Cognitive Domain: Knowledge
Answer Location: Chromosomal Abnormalities
Question Type: MC

60. Vince has one of the most common sex chromosome abnormalities. Vince has _____ syndrome.
a. Klinefelter
b. Down
c. XYY
d. fragile X
Ans: a
Learning Objective: 2.6
Cognitive Domain: Application
Answer Location: Chromosomal Abnormalities
Question Type: MC

61. Kaden is very thin, has severe acne, and demonstrates poor coordination. He also produces excessive levels of testosterone. Kaden has _____ syndrome.
a. Klinefelter
b. Down
c. XYY
d. fragile X
Ans: c
Learning Objective: 2.6
Cognitive Domain: Application
Answer Location: Chromosomal Abnormalities
Question Type: MC

62. Approximately 1 in 1,000 females are born with _____ syndrome.
a. Klinefelter
b. triple X
c. XYY
d. fragile X
Ans: b
Learning Objective: 2.6
Cognitive Domain: Comprehension
Answer Location: Chromosomal Abnormalities
Question Type: MC

63. Danica, age 28, is very short in stature, has an abnormally small jaw, and her neck has extra folds of skin. Danica has never ovulated and she has underdeveloped breasts. Danica suffers from ____syndrome.
a. Klinefelter
b. triple X
c. XYY
d. Turner
Ans: d
Learning Objective: 2.6
Cognitive Domain: Application
Answer Location: Chromosomal Abnormalities
Question Type: MC

64. In some instances, a(n) _____ causes a sudden change and abnormality in the structure of genes.
a. mutation
b. extra chromosome
c. broken chromosome
d. allele
Ans: a
Learning Objective: 2.6
Cognitive Domain: Knowledge
Answer Location: Mutation
Question Type: MC

65. Which of the following may result in mutated genes?
a. High-fat diet
b. Exposure to radiation
c. Young maternal age
d. Poverty
Ans: b
Learning Objective: 2.6
Cognitive Domain: Comprehension
Answer Location: Mutation
Question Type: MC

66. In Africa, children who inherit a single sickle cell allele are more resistant to malarial infection and more likely to survive. This demonstrates:
a. that nature is more influential than nurture.
b. the epigenetic framework.
c. that mutations can sometimes be beneficial.
d. the purpose of behavioral genetics.
Ans: c
Learning Objective: 2.6

Cognitive Domain: Comprehension
Answer Location: Mutation
Question Type: MC

67. _____ is a medical specialty that helps prospective parents determine the risk that their children will inherit genetic defects and chromosomal abnormalities.
a. Obstetrics
b. Behavior genetics
c. Prenatal diagnosis
d. Genetic counseling
Ans: d
Learning Objective: 2.7
Cognitive Domain: Knowledge
Answer Location: Predicting and Detecting Genetic Disorders
Question Type: MC

68. Which of the following individuals would be a good candidate for genetic counseling?
a. Maria, who previously had twins
b. Beth, who is 37
c. Ariel, who is a pregnant teenager
d. Coral, who is unsure if she wants children
Ans: b
Learning Objective: 2.7
Cognitive Domain: Application
Answer Location: Predicting and Detecting Genetic Disorders
Question Type: MC

69. When is prenatal screening likely to be recommended?
a. When genetic counseling has determined a risk for genetic abnormalities
b. When the mother is under age 20 or over age 30
c. When the mother has gained more than the recommended weight in the first trimester
d. Prenatal screening is recommended for all pregnancies in the United States
Ans: a
Learning Objective: 2.7
Cognitive Domain: Comprehension
Answer Location: Predicting and Detecting Genetic Disorders
Question Type: MC

70. The most widespread and routine method of prenatal diagnosis is _____.
a. amniocentesis
b. chorionic villus sampling
c. noninvasive prenatal testing (NIPT)
d. ultrasound
Ans: d
Learning Objective: 2.7
Cognitive Domain: Knowledge
Answer Location: Predicting and Detecting Genetic Disorders
Question Type: MC

71. Ultrasound allows physicians to:
a. analyze the fetus' genotype.
b. administer hormones to the developing fetus.
c. diagnose most chromosomal disorders.
d. determine the sex of the fetus.
Ans: d

Learning Objective: 2.7
Cognitive Domain: Comprehension
Answer Location: Predicting and Detecting Genetic Disorders
Question Type: MC

72. _____ is recommended for women ages 35 and over, especially if the woman and partner are both known carriers of genetic diseases.
a. Ultrasound
b. Amniocentesis
c. Chorionic villus sampling
d. Noninvasive prenatal testing (NIPT)
Ans: b
Learning Objective: 2.7
Cognitive Domain: Comprehension
Answer Location: Predicting and Detecting Genetic Disorders
Question Type: MC

73. Amniocentesis should not be conducted before the _____ week of pregnancy, as it may increase the risk of miscarriage.
a. 15th
b. 20th
c. 27th
d. 30th
Ans: a
Learning Objective: 2.7
Cognitive Domain: Comprehension
Answer Location: Predicting and Detecting Genetic Disorders
Question Type: MC

74. _____ requires studying a small amount of tissue from the chorion to determine the presence of chromosomal abnormalities.
a. Amniocentesis
b. Chorionic villus sampling
c. Noninvasive prenatal testing (NIPT)
d. Ultrasound
Ans: b
Learning Objective: 2.7
Cognitive Domain: Knowledge
Answer Location: Predicting and Detecting Genetic Disorders
Question Type: MC

75. When conducted prior to 10 weeks gestational age, _____ may increase the likelihood of limb defects and miscarriage.
a. ultrasound
b. amniocentesis
c. chorionic villus sampling
d. noninvasive prenatal testing (NIPT)
Ans: c
Learning Objective: 2.7
Cognitive Domain: Comprehension
Answer Location: Predicting and Detecting Genetic Disorders
Question Type: MC

76. Which of the following tests is the least invasive for detecting chromosomal abnormalities?
a. ultrasound

b. amniocentesis
c. chorionic villus sampling
d. NIPT
Ans: d
Learning Objective: 2.7
Cognitive Domain: Comprehension
Answer Location: Predicting and Detecting Genetic Disorders
Question Type: MC

77. Using _____, cell-free fetal DNA are examined by drawing blood from the mother.
a. amniocentesis
b. chorionic villus sampling
c. NIPT
d. ultrasound
Ans: c
Learning Objective: 2.7
Cognitive Domain: Knowledge
Answer Location: Predicting and Detecting Genetic Disorders
Question Type: MC

78. Due to recent advances in genetics and fetal medicine, _____ can repair defects of the heart, lung, urinary tract and other areas.
a. fetal surgery
b. chorionic villus sampling
c. NIPT
d. ultrasound
Ans: a
Learning Objective: 2.7
Cognitive Domain: Comprehension
Answer Location: Predicting and Detecting Genetic Disorders
Question Type: MC

79. Our genetic makeup, inherited from our biological parents, consists of a complex blend of hereditary characteristics known as _____.
a. genotype
b. phenotype
c. behavior genetics
d. canalization
Ans: a
Learning Objective: 2.8
Cognitive Domain: Knowledge
Answer Location: Heredity and Environment
Question Type: MC

80. Gia has brown hair, brown eyes, and dark skin. These traits are part of Gia's _____.
a. genotype
b. phenotype
c. reaction range
d. epigenetic framework
Ans: b
Learning Objective: 2.8
Cognitive Domain: Application
Answer Location: Heredity and Environment
Question Type: MC

81. _____ is the field of study that examines how genes and experiences combine to influence the diversity of human traits, abilities, and behaviors.
a. Human lifespan development
b. Neurology
c. Behavior genetics
d. Molecular biology
Ans: c
Learning Objective: 2.8
Cognitive Domain: Knowledge
Answer Location: Behavioral Genetics
Question Type: MC

82. Dr. Rashaud recognizes that even traits that have a strong genetic component, such as height, are modified by environmental influences. Dr. Rashaud studies _____.
a. behavior genetics
b. molecular biology
c. biochemistry
d. fetal medicine
Ans: a
Learning Objective: 2.8
Cognitive Domain: Application
Answer Location: Behavioral Genetics
Question Type: MC

83. _____ refers to the extent to which variation among people on a given characteristic is due to genetic differences.
a. Phenotype
b. Genotype
c. Reaction range
d. Heritability
Ans: d
Learning Objective: 2.8
Cognitive Domain: Knowledge
Answer Location: Behavioral Genetics
Question Type: MC

84. Using _____, behavior geneticists deliberately modify the genetic makeup of animals to examine the influence of heredity on attributes and behavior.
a. research on twins
b. selective breeding studies
c. family studies
d. heritability estimates
Ans: b
Learning Objective: 2.8
Cognitive Domain: Knowledge
Answer Location: Behavioral Genetics
Question Type: MC

85. Family studies usually involve _____ studies and _____ studies.
a. twin; selective breeding
b. identical twin; fraternal twin
c. genetic; environmental
d. twin; adoption
Ans: d
Learning Objective: 2.8

Cognitive Domain: Knowledge
Answer Location: Behavioral Genetics
Question Type: MC

86. Michael and Matthew are identical twins. The boys share ____ percent of their genes.
a. 25
b. 50
c. 75
d. 100
Ans: d
Learning Objective: 2.8
Cognitive Domain: Application
Answer Location: Behavioral Genetics
Question Type: MC

87. C.J. and Naya are fraternal twins. They share about ____ percent of their genes.
a. 25
b. 50
c. 75
d. 100
Ans: b
Learning Objective: 2.8
Cognitive Domain: Application
Answer Location: Behavioral Genetics
Question Type: MC

88. Twin studies help us estimate how much of a trait or behavior is attributable to _____, whereas adoption studies shed light on the extent to which attributes and behaviors are influenced by _____.
a. genes; the environment
b. the environment; genes
c. siblings; parents
d. random events; a controlled environment
Ans: a
Learning Objective: 2.8
Cognitive Domain: Comprehension
Answer Location: Behavioral Genetics
Question Type: MC

89. According to research examining the relationship between genotype and environment to intellectual abilities, which of the following pairs of individuals will be MOST similar in intelligence?
a. Casey and Jordan, who are biological siblings
b. Eileen and Sarah, who are mother and daughter
c. Hugh and Connor, who are grandfather and grandson
d. Maleeka and Chantel, who are adopted siblings
Ans: a
Learning Objective: 2.8
Cognitive Domain: Application
Answer Location: Behavioral Genetics
Question Type: MC

90. A wide range of potential expressions of a genetic trait, depending on environmental opportunities and constraints, is called _____.
a. canalization
b. behavioral genetics
c. range of reaction

d. gene-environment correlation
Ans: c
Learning Objective: 2.9
Cognitive Domain: Knowledge
Answer Location: Gene-Environment Interaction
Question Type: MC

91. Although both of his parents are 5 feet 7 inches tall, 17-year-old Theo is 6 feet tall. He is healthy and has been well nourished since birth. This example illustrates the concept of _____.
a. canalization
b. behavior genetics
c. range of reaction
d. gene-environment correlation
Ans: c
Learning Objective: 2.9
Cognitive Domain: Application
Answer Location: Gene-Environment Interaction
Question Type: MC

92. Marcus and J.J grew up in the same neighborhood, which has a reputation for poverty and gang violence. Both of their fathers were violent alcoholics, and they experienced periodic homelessness. Marcus carries the low-MAOA gene, while J.J. carries the high-MAOA gene. Which statement about Marcus and J.J. is true?
a. Both boys are at equal risk for aggression and criminal behavior in adulthood.
b. Marcus is at greater risk for aggression and criminal behavior in adulthood than J.J.
c. J.J. is at greater risk for aggression and criminal behavior in adulthood that Marcus.
d. Neither boy is at-risk for aggression and criminal behavior in adulthood.
Ans: b
Learning Objective: 2.9
Cognitive Domain: Application
Answer Location: Box 2.2 Lives in Context: Gene-Environment Interactions and Responses to Child Maltreatment
Question Type: MC

93. _____ refers to the tendency of heredity to narrow the range of development to only one or a few outcomes.
a. Range of reaction
b. Epigenesis
c. Canalization
d. Passive correlation
Answer: c
Learning Objective: 2.9
Cognitive Domain: Knowledge
Answer Location: Gene-Environment Interaction
Question Type: MC

94. Which of the following traits is strongly canalized?
a. Personality
b. Intelligence
c. Weight
d. Crawling
Ans: d
Learning Objective: 2.9
Cognitive Domain: Comprehension

Answer Location: Gene-Environment Interaction
Question Type: MC

95. _____ refers to the idea that many of our traits are supported by both our genes and environment.
a. Range of reaction
b. Heritability
c. Canalization
d. Gene-environment correlation
Ans: d
Learning Objective: 2.9
Cognitive Domain: Knowledge
Answer Location: Gene-Environment Interaction
Question Type: MC

96. Four-year-old Sam's parents were star athletes in high school and college. They are both coaches and manage a gym during the summer months. Sam has been exposed to sports since he was a baby. In addition to throwing and kicking balls with his parents, Sam recently started soccer and T-ball. He has also been enrolled in swimming lessons since he was 9 months old. Sam is already demonstrating strong athletic skills, despite being very young. This example demonstrates a(n) _____ gene-environment correlation.
a. passive
b. evocative
c. active
d. positive
Ans: a
Learning Objective: 2.9
Cognitive Domain: Application
Answer Location: Gene-Environment Interaction
Question Type: MC

97. In general, we respond to happy, playful toddlers differently than we respond to standoffish, irritable toddlers. For instance, we may smile and interact more with the happy toddler, while redirecting, ignoring, or trying to change the behavior of the irritable toddler. This example illustrates a(n) _____ gene-environment correlation.
a. passive
b. evocative
c. active
d. positive
Ans: b
Learning Objective: 2.9
Cognitive Domain: Comprehension
Answer Location: Gene-Environment Interaction
Question Type: MC

98. Marlo's parents are talented artists. When he was young, Marlo was exposed to drawing and painting lessons, taken to art shows, and encouraged to be creative in his daily life. Today, at age 18, Marlo creates experiences and environments that correspond to and influence his genetic predisposition. For example, he enjoys spending weekends at the park or other public areas drawing people and objects. He often invites friends to various art exhibits in the city and he has enrolled in several art classes in college. He even helped paint a mural at a local children's hospital. Marlo's artistic endeavors at age 18 are an example of a(n) _____ gene-environment correlation.
a. passive
b. evocative
c. active
d. positive

Ans: c
Learning Objective: 2.9
Cognitive Domain: Application
Answer Location: Gene-Environment Interaction
Question Type: MC

99. The tendency to actively seek out experiences and environments compatible and supportive of our genetic tendencies is called _____.
a. a passive gene-environment correlation
b. range of reaction
c. the epigenetic framework
d. niche-picking
Ans: d
Learning Objective: 2.9
Cognitive Domain: Knowledge
Answer Location: Gene-Environment Interaction
Question Type: MC

100. The dynamic interplay between heredity and environment is known as _____.
a. genetic studies
b. the epigenetic framework
c. an evocative gene-environment correlation
d. niche-picking
Ans: b
Learning Objective: 2.9
Cognitive Domain:
Answer Location: Epigenetic Framework
Question Type: MC

101. According to the epigenetic framework:
a. genetics have a greater influence on development than environmental factors.
b. environmental factors play a greater role in development than genetics.
c. both identical and fraternal twins are more similar than different.
d. development results from ongoing reciprocal interactions between genetics and environment.
Ans: d
Learning Objective: 2.9
Cognitive Domain: Comprehension
Answer Location: Epigenetic Framework
Question Type: MC

102. A particularly important finding associated with the study of epigenetics is that:
a. heredity actually plays a minimal role in long-term development.
b. what you eat and do today could affect the health and characteristics of your children.
c. females are actually more vulnerable to genetic diseases than males.
d. passive gene-environment correlations influence development well into old age.
Ans: b
Learning Objective: 2.9
Cognitive Domain: Comprehension
Answer Location: Box 2.3 Applying Developmental Science: Altering the Epigenome
Question Type: MC

True/False

1. The majority of our genetic material is unique to humans.
Ans: False
Learning Objective: 2.1
Cognitive Domain: Knowledge
Answer Location: The Genetic Code
Question Type: TF

2. Although all humans share the basic genome, each of us has a slightly different code, which makes us genetically distinct from other humans.
Ans: True
Learning Objective: 2.1
Cognitive Domain: Knowledge
Answer Location: The Genetic Code
Question Type: TF

3. In the first stage of mitosis, each half of the DNA molecule regenerates and replaces its missing parts, leading to the formation of two distinct cells.
Ans: False
Learning Objective: 2.2
Cognitive Domain: Comprehension
Answer Location: Cell Reproduction
Question Type: TF

4. The process of crossing-over, which occurs during meiosis, creates unique combinations of genes.
Ans: True
Learning Objective: 2.2
Cognitive Domain: Comprehension
Answer Location: Cell Reproduction
Question Type: TF

5. A human zygote contains 46 matching pairs of chromosomes.
Ans: False
Learning Objective: 2.2
Cognitive Domain: Knowledge
Answer Location: Cell Reproduction
Question Type: TF

6. In humans, 23 pairs of chromosomes are matched containing similar genes in almost identical positions and sequence, reflecting the distinct blueprint of the biological mother and father.
Ans: False
Learning Objective: 2.2
Cognitive Domain: Knowledge
Answer Location: Sex Determination
Question Type: TF

7. All ova contain one X sex chromosome.
Ans: True
Learning Objective: 2.2
Cognitive Domain: Knowledge

Answer Location: Sex Determination
Question Type: TF

8. Males' sex chromosome pair includes two X chromosomes.
Ans: False
Learning Objective: 2.2
Cognitive Domain: Knowledge
Answer Location: Sex Determination
Question Type: TF

9. Genetically, monozygotic twins are no more similar to each other than are other siblings that are conceived and born separately.
Ans: False
Learning Objective: 2.3
Cognitive Domain: Comprehension
Answer Location: Genes Shared by Twins
Question Type: TF

10. About two thirds of naturally conceived twins are dizygotic twins.
Ans: True
Learning Objective: 2.3
Cognitive Domain: Knowledge
Answer Location: Genes Shared by Twins
Question Type: TF

11. Monozygotic twins are more common than dizygotic twins.
Ans: False
Learning Objective: 2.3
Cognitive Domain: Knowledge
Answer Location: Genes Shared by Twins
Question Type: TF

12. Dominant genes are always expressed, regardless of the gene they are paired with.
Ans: True
Learning Objective: 2.4
Cognitive Domain: Knowledge
Answer Location: Dominant-Recessive Inheritance
Question Type: TF

13. Baldness is an example of a recessive trait.
Ans: True
Learning Objective: 2.4
Cognitive Domain: Knowledge
Answer Location: Dominant-Recessive Inheritance
Question Type: TF

14. Polygenic inheritance is a pattern in which both dominant and recessive genes influence a trait or characteristic.
Ans: False
Learning Objective: 2.4
Cognitive Domain: Knowledge
Answer Location: Incomplete Dominance
Question Type: TF

15. According to the concept of incomplete dominance, a heterozygous person with the alleles for blood type A and B will have blood type O.
Ans: False
Learning Objective: 2.4
Cognitive Domain: Comprehension
Answer Location: Incomplete Dominance
Question Type: TF

16. Height is an example of polygenic inheritance.
Ans: True
Learning Objective: 2.4
Cognitive Domain: Comprehension
Answer Location: Polygenic Inheritance
Question Type: TF

17. Prader-Willi and Angelman syndromes are both caused by an abnormality in the 15th chromosome.
Ans: True
Learning Objective: 2.4
Cognitive Domain: Knowledge
Answer Location: Genomic Imprinting
Question Type: TF

18. Most diseases are inherited through dominant inheritance.
Ans: False
Learning Objective: 2.5
Cognitive Domain: Knowledge
Answer Location: Genetic Disorders
Question Type: TF

19. Females are more likely than males to be affected by X-linked disorders.
Ans: False
Learning Objective: 2.5
Cognitive Domain: Knowledge
Answer Location: Genetic Disorders
Question Type: TF

20. Fragile X syndrome occurs more often in males than females.
Ans: True
Learning Objective: 2.5
Cognitive Domain: Comprehension
Answer Location: Genetic Disorders
Question Type: TF

21. Contrary to popular belief, most individuals with Down syndrome are of average intelligence.
Ans: False
Learning Objective: 2.6
Cognitive Domain: Knowledge
Answer Location: Genetic Disorders
Question Type: TF

22. The majority of sex chromosome abnormalities are fatal.
Ans: False
Learning Objective: 2.6
Cognitive Domain: Knowledge

Answer Location: Genetic Disorders
Question Type: TF

23. Most mutations are fatal.
Ans: True
Learning Objective: 2.6
Cognitive Domain: Knowledge
Answer Location: Mutation
Question Type: TF

24. Today, genetic counseling is recommended for all couples planning to have children.
Ans: False
Learning Objective: 2.7
Cognitive Domain: Knowledge
Answer Location: Predicting and Detecting Genetic Disorders
Question Type: TF

25. Noninvasive prenatal testing (NIPT) presents no risk to the developing fetus.
Ans: True
Learning Objective: 2.7
Cognitive Domain: Knowledge
Answer Location: Predicting and Detecting Genetic Disorders
Question Type: TF

26. Prenatal screening can only identify common chromosomal disorders, such as Down syndrome, and present considerable risk to the developing fetus.
Ans: False
Learning Objective: 2.7
Cognitive Domain: Comprehension
Answer Location: Predicting and Detecting Genetic Disorders
Question Type: TF

27. Selective breeding studies are used to compare people who live together and share varying degrees of relatedness.
Ans: False
Learning Objective: 2.8
Cognitive Domain: Knowledge
Answer Location: Behavioral Genetics
Question Type: TF

28. Because identical twins share 100% of their genes, there are exactly alike in personality and intelligence.
Answer: False
Learning Objective: 2.8
Cognitive Domain: Knowledge
Answer Location: Behavioral Genetics
Question Type: TF

29. According to the concept of reaction range, genetics set the range of developmental outcomes and the environment influences where, within the range, the person will fall.
Answer: True
Learning Objective: 2.9
Cognitive Domain: Knowledge
Answer Location: Gene-Environment Interaction
Question Type: TF

30. For strongly canalized traits, such as walking, only extreme experiences or changes in the environment can prevent the skill from developing.
Answer: True
Learning Objective: 2.9
Cognitive Domain: Knowledge
Answer Location: Gene-Environment Interaction
Question Type: TF

31. Passive gene-environment correlations primarily influence development in late childhood and adolescence.
Answer: False
Learning Objective: 2.9
Cognitive Domain: Knowledge
Answer Location: Gene-Environment Interaction
Question Type: TF

32. The epigenetic framework explains the influence of heredity on characteristics such as height, weight, and mental health.
Answer: False
Learning Objective: 2.9
Cognitive Domain: Knowledge
Answer Location: Epigenetic Framework
Question Type: TF

Short Answer

1. Explain the difference between dizygotic and monozygotic twins.
Ans: Dizygotic (DZ) twins are also called fraternal twins. DZ twins are conceived when a woman releases more than one ovum and each is fertilized by a different sperm. Genetically, DZ twins are no more similar to each other than other siblings that are conceived and born separately. Monozygotic (MZ), or identical twins, originate from the same zygote. MZ twins occur when the zygote splits into two distinct separate but identical zygotes that develop into two infants. MZ twins share the same genotype, with identical instructions for all physical and psychological characteristics.
Learning Objective: 2.3
Cognitive Domain: Comprehension
Answer Location: Genes Shared by Twins
Question Type: SA

2. List three examples of dominant traits and three examples of recessive traits.
Ans: Students can list any three examples from each list.
Dominant traits include: dark hair, curly hair, hair, non-red hair, facial dimples, brown eyes, second toe longer than big toe, normal color vision, and extra digits.
Recessive traits include: blond hair, straight hair, baldness, red hair, no dimples, blue/green/hazel eyes, big toe longer than second toe, color blindness, and five digits.
Learning Objective: 2.4
Cognitive Domain: Application
Answer Location: Dominant-Recessive Inheritance
Question Type: SA

3. Cite four syndromes/diseases that are acquired through X-linked inheritance. Are males or females at greater risk for these disorders?

Ans: Four syndromes or diseases that are acquired through X-linked inheritance include: color blindness, Duchenne muscular dystrophy, fragile X syndrome, and hemophilia. Males are at significantly greater risk for all of these disorders.
Learning Objective: 2.5
Cognitive Domain: Knowledge
Answer Location: Genetic Disorders
Question Type: SA

4. Identify four methods of prenatal diagnosis. Which two pose some risk to the developing fetus, especially if performed early in the pregnancy?
Ans: The four methods of prenatal diagnosis include: ultrasound, amniocentesis, chorionic villus sampling, and noninvasive prenatal testing. Amniocentesis and chorionic villus sampling can cause harm to the fetus, particularly if performed early in the pregnancy.
Learning Objective: 2.7
Cognitive Domain: Knowledge
Answer Location: Predicting and Detecting Genetic Disorders
Question Type: SA

5. List the three types of gene-environment correlations. How do these correlations change with age?
Ans: Three types of gene-environment correlations are passive, reactive/evocative, and active. Passive gene–environment correlations are common at birth as caregivers determine infants' experiences. Evocative gene–environment correlations also occur from birth, as infants' inborn traits and tendencies influence others, evoking responses that support their own genetic predispositions. In contrast, active gene–environment correlations take place as children grow older and more independent. As they become increasingly capable of controlling parts of their environment, they engage in niche-picking by choosing their own interests and activities, actively shaping their own development.
Learning Objective: 2.9
Cognitive Domain: Knowledge
Answer Location: Gene-Environment Interaction
Question Type: SA

Essay

1. Distinguish between the two processes of cell reproduction.
Ans: Most cells in the human body reproduce through a process known as mitosis in which DNA replicates itself, permitting the duplication of chromosomes, and ultimately the formation of new cells with identical genetic material. In the first stage of mitosis, the rungs of the ladder-shaped DNA split, opening like a zipper. Then each half of the DNA molecule regenerates and replaces its missing parts, forming two distinct cells. It is this process that enables humans to develop from a single fertilized egg into a child, adolescent, and finally, adult. The process of mitosis accounts for the replication of all body cells.
The second process—meiosis—the reproduction of gametes (sex cells), occurs in two stages. First, the 46 chromosomes begin to replicate as in mitosis, duplicating themselves. But before the cell completes dividing, a critical process called crossing-over takes place. Chromosome pairs align and DNA segments cross over, moving from one member of the pair to the other. Crossing-over creates unique combinations of genes. The cell then divides into two cells, each with 46 chromosomes. As the new cells replicate, they create cells containing only 23 single, unpaired chromosomes. The resulting gametes each have only one chromosome from each pair (that is, one each from the male and female). This permits the joining of sperm and ovum at fertilization to produce a fertilized egg, or zygote, with 46 chromosomes, forming 23 pairs with half from the biological mother and half from the biological father.
Learning Objective: 2.2
Cognitive Domain: Analysis
Answer Location: Cell Reproduction
Question Type: ESS

2. Kentrall and Sharice just had a baby who was diagnosed with phenylketonuria (PKU). Describe this disorder. How can Kentrall and Sharice ensure that their son will not develop permanent intellectual disability?
Ans: Phenylketonuria (PKU) is a disorder that prevents the body from producing an enzyme that breaks down phenylalanine, an amino acid, from proteins. The phenylalanine builds up quickly to toxic levels that damage the central nervous system, contributing to mental retardation by 1 year of age. However, permanent damage is not inevitable. Infants who are placed on a strict diet low in phenylalanine (which must continue throughout the childhood into adolescence and adulthood) usually attain average or near-average levels of intelligence.
Learning Objective: 2.5
Cognitive Domain: Application
Answer Location: Genetic Disorders
Question Type: ESS

3. Why are males more likely than females to be affected by X-linked disorders?
Ans: Males (XY) are more likely to be affected by X-linked genetic disorders because they have only one X chromosome. In contrast, females have two X chromosomes; a recessive gene located on one X chromosome will be masked by a dominant gene on the other X chromosome. Females are thereby less likely to display X-linked genetic disorders because both of their X-chromosomes must carry the recessive genetic disorder for it to be displayed.
Learning Objective: 2.5
Cognitive Domain: Comprehension
Answer Location: Genetic Disorders
Question Type: ESS

4. Consider the following scenario: Your best friend recently married. Your friend has a cousin with autism, and her husband's side of the family has a history of several genetic disorders, including Huntington's disease. The couple is worried about having children and they want to know if their potential offspring will be at risk for one of these disorders. They have an appointment to see a genetic counselor in two weeks. Explain to your friends what will happen during their visit.
Ans: Upon meeting your friends, the genetic counselor will construct a family history of heritable disorders for both prospective parents in order to determine the prevalence of various disorders and diseases. If either member of the couple appears to carry a genetic disorder, genetic screening blood tests may be carried out on both parents to detect chromosomal abnormalities and the presence of dominant and recessive genes for various disorders. Based on the test results, the counselor will help your friends make an informed decision about their risk for passing on a genetic disorder to their children.
Learning Objective: 2.7
Cognitive Domain: Application
Answer Location: Predicting and Detecting Genetic Disorders
Question Type: ESS

5. Professor Kahn is an expert in behavior genetics. Her research team primarily conducts family studies to compare people who live together and share varying degrees of relatedness. Describe the two types of family studies that Professor Kahn uses in her research, including what these studies tell us about genetic and environmental influences on behavior.
Ans: Two kinds of family studies are common: twin studies and adoption studies. Twin studies compare identical and fraternal twins to estimate how much of a trait or behavior is attributable to genes. If genes affect the attribute, identical twins should be more similar than fraternal twins because identical twins share 100% of their genes, whereas fraternal twins share only about 50%.
Adoption studies compare the degree of similarity between adopted children and their biological parents, whose genes they share (50%), and their adoptive parents, with whom they share no genes. If the adopted children share similarities with their biological parents, even though they were not raised by them, it suggests that the similarities are genetic. Adoption studies also help us determine the extent to which attributes and behaviors are influenced by the environment. For example, the degree to which two genetically unrelated adopted children reared together are similar speaks to the role of environment.

Comparisons of identical twins reared in the same home with those reared in different environments can also illustrate environmental contributions to phenotypes. If identical twins reared together are more similar than those reared apart, an environmental influence can be inferred.
Learning Objective: 2.8
Cognitive Domain: Application
Answer Location: Behavioral Genetics
Question Type: ESS

6. Describe the epigenetic framework using the example of brain development.
Ans: Providing an infant with a healthy diet and opportunities to explore the world will support the development of brain cells, a process that is governed by genes. Brain development, in turn, influences motor development, further supporting the infant's exploration of the physical and social world, thereby promoting cognitive and social development. Active engagement in the world encourages connections among brain cells. In this way, brain development, like all other aspects of development, is influenced by dynamic interactions between biological and environmental factors.
Learning Objective: 2.9
Cognitive Domain: Application
Answer Location: Epigenetic Framework
Question Type: ESS