Bio12-Q2W2-Qs Bank-Human Heridity

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. You and your colleagues are constructing a pedigree for a patient with cystic fibrosis. The individual's brother has also been diagnosed with cystic fibrosis. How would this brother be represented in the pedigree?
a. Shaded circle
b. Shaded square
c. Unshaded circle
d. Unshaded square

____ 2. Which of the following disorders is most common among the Amish and Ashkenazic Jewish populations?
a. Phenylketonuria
b. Cystic fibrosis
c. Cerebral palsy
d. Tay-Sachs disease

____ 3. A man carrying the allele for Huntington's disease marries a woman who is homozygous recessive for the allele. What is the probability that their offspring will develop Huntington's disease?
a. 1/2
b. 1/4
c. 3/4
d. None of the above

____ 4. An individual has type AB blood. His father has type A blood and his mother has type B blood. The individual's phenotype is an example of —
a. simple recessive heredity.
b. simple dominant heredity.
c. incomplete dominance.
d. codominance.

____ 5. Many traits, such as stem length, are controlled by multiple genes. This is called —
a. simple dominant inheritance.
b. monogenic inheritance.
c. polygenic inheritance.
d. codominance.

____ 6. Which of the following traits is mediated by X-linked inheritance?
a. Hemophilia
b. Sickle-cell anemia
c. Blood type
d. None of the above

____ 7. A chart of an individual's chromosome pairs is called a karyotype. Analysis of a karyotype can reveal which of the following?
a. Phenotype
b. Genotype
c. Trisomy
d. All of the above

____ 8. Which of the following diseases is characterized by an accumulation of phenylalanine in the body?
a. Cystic fibrosis
b. PKU
c. Huntington's disease
d. Tay-Sachs disease

____ 9. A couple has a child who, with respect to a specific trait, resembles neither parent. Which of the following is NOT a possible mechanism for this trait?
a. Simple recessive heredity
b. Codominance
c. Incomplete dominance
d. Simple dominant heredity

____ 10. The type of inheritance shown when a red-flowering plant is crossed with a white-flowering plant and only pink-flowering plants are produced is _____.
a. inbreeding
b. incomplete dominance
c. polygenic inheritance
d. codominance

____ 11. A trait controlled by four alleles is said to have _____.
a. homologous alleles
b. autosomes
c. hybridization
d. multiple alleles

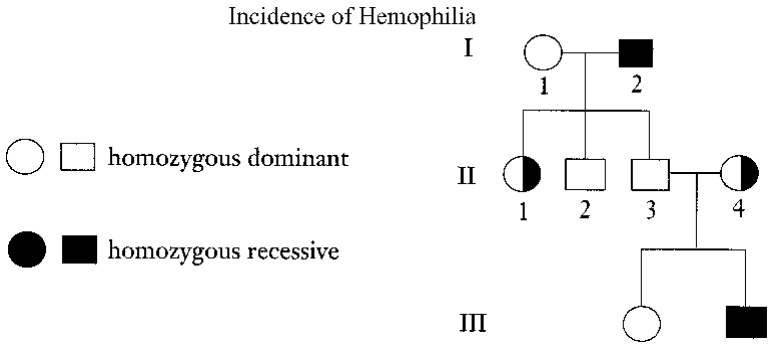


Figure 12-1

____ 12. Refer to Figure 12-1. If individual III-2 marries a person with the same genotype as individual I-1, what is the chance that one of their children will be afflicted with hemophilia?
a. 0%
b. 25%
c. 50%
d. 75%

____ 13. For the trait being followed in the pedigree, individuals II-1 and II-4 in Figure 12-1 can be classified as _____.
a. homozygous dominant
b. mutants
c. homozygous recessive
d. carriers

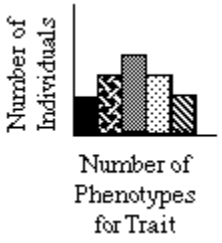
____ 14. If a female fruit fly heterozygous for red eyes (X^RX^r) crossed with a white-eyed male (X^rY), what percent of their offspring would have white eyes?
a. 0%
b. 25%
c. 50%
d. 75%

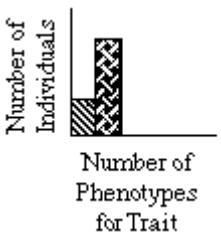
____ 15. When roan cattle are mated, 25% of the offspring are red, 50% are roan, and 25% are white. Upon examination, it can be seen that the coat of a roan cow consists of both red and white hairs. This trait is one controlled by _____.
a. multiple alleles
b. codominant alleles
c. sex-linked genes
d. polygenic inheritance

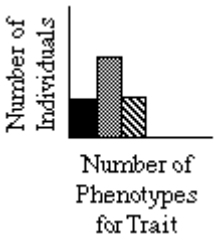
____ 16. A cross between a white rooster and a black hen results in 100% blue Andalusian offspring. When two of these blue offspring are mated, the probable phenotypic ratio seen in their offspring would be _____.
a. 100% blue
b. 75% black, 25% white
c. 75% blue, 25% white
d. 25% black, 50% blue, 25% white

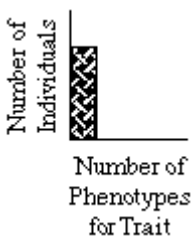
____ 17. Because the gene for red-green color blindness is located on the X chromosome, it is normally <u>not</u> possible for a _____.
a. carrier mother to pass the gene on to her daughter
b. carrier mother to pass the gene on to her son
c. color blind father to pass the gene on to his daughter
d. color blind father to pass the gene on to his son

____ 18. Which of the bar graphs shown below represents what the phenotypic frequencies might be for polygenic inheritance?

a.


b.


c.


d.


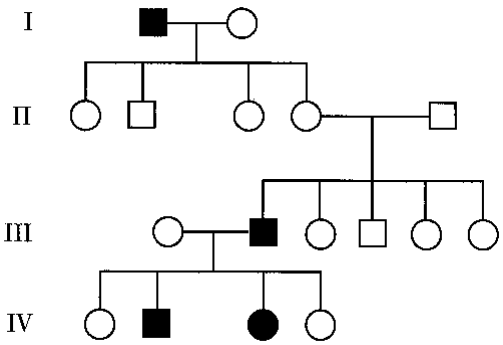


Figure 12-3

____ 19. What is the probable mode of inheritance for the normal trait in Figure 12-3?
a. simple dominant
b. polygenic
c. sex linkage
d. multiple alleles

____ 20. Based on Figure 12-3, what do you know about individual III-1's mother?
a. She had the trait.
b. She was a carrier.
c. She was homozygous recessive.
d. She was homozygous dominant.

____ 21. Eye color in humans is the result of _____ inheritance.
a. multiple allelic
b. polygenic
c. sex-linked
d. simple dominant

____ 22. The blood types A, B, AB, and O are the result of _____ inheritance.
a. multiple allelic
b. polygenic
c. sex-linked
d. simple dominant

____ 23. A child is diagnosed with a rare genetic disease. Neither parent has the disease. How might the child have inherited the disorder?
a. The disorder is dominant and was carried by a parent.
b. The disorder is recessive and carried by both parents.
c. The disorder is sex linked and inherited only from the father.
d. The disorder could occur only as a mutation in the child because neither parent had the disease.

____ 24. Two healthy parents produce a child with the genetic disorder of cystic fibrosis, which is the result of a recessive gene. What would be the best explanation for this inheritance?
a. This is not the result of a genetic disorder.
b. Both parents carried the recessive gene for cystic fibrosis.
c. Cystic fibrosis is a chromosomal mutation that occurred during development and is not related to the parental genotypes.
d. Cystic fibrosis is caused by a mutation in the 21st pair of chromosomes.

____ 25. Cystic fibrosis and Tay-Sachs disease are typical of recessive disorders concentrated in _____.
a. ethnic groups
b. families with a single child
c. countries with hot, wet climates
d. the United States

____ 26. Most human genetic disorders are caused by the expression of _____.
a. recessive alleles
b. two dominant alleles
c. one dominant allele
d. sex-linked heredity

____ 27. Which of the following situations is most usual for a dominant allele that results in severe effects in the offspring?
a. Both parents have the trait.
b. Only a single offspring has the trait.
c. The trait occurs by mutation.
d. none of these

____ 28. A phenotype that results from a dominant allele must have at least _____ dominant allele(s) present in the parent(s).
a. one
b. two
c. three
d. four

____ 29. Examine the graph in Figure 12-4, which illustrates the frequency in types of skin pigmentation in humans. Another human trait that would show a similar inheritance pattern and frequency of distribution is _____.

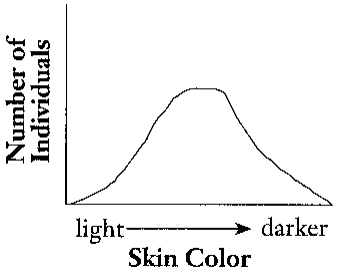


Figure 12-4

a. height
b. blood type
c. number of fingers and toes
d. incidence of cystic fibrosis

____ 30. Following the detection of phenylketonuria or PKU in an infant, the treatment used in order to prevent mental retardation is _____.
a. injection of missing enzymes
b. periodic blood transfusions
c. physical therapy
d. dietary adjustments

____ 31. Which of the following genetic disorders can be detected by karyotyping?
a. Down syndrome
b. Tay-Sachs disease and phenylketonuria
c. hemophilia and cystic fibrosis
d. Klinefelter syndrome and sickle-cell anemia

____ 32. A human genetic defect that results in the failure to metabolize the amino acid phenylalanine is _____.
a. Turner syndrome
b. Down syndrome
c. phenylketonuria
d. cystic fibrosis

____ 33. A human genetic disorder caused by a dominant gene is _____.
a. Tay-Sachs disease
b. cystic fibrosis
c. phenylketonuria
d. Huntington's disease

____ 34. In humans, red-green color blindness is _____.
a. caused by a recessive allele
b. equally common in both sexes
c. inherited in males from their fathers
d. produced in males by a heterozygous genotype

____ 35. A man heterozygous for blood type A marries a woman heterozygous for blood type B. The chance that their first child will have type O blood is _____.
a. 0%
b. 25%
c. 50%
d. 75%

____ 36. According to Figure 12-5, what is the chance that individual A will be afflicted with Huntington's?

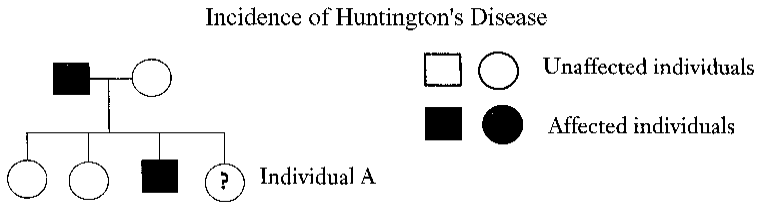


Figure 12-5

a. 25%
b. 50%
c. 75%
d. 100%

____ 37. Individuals with Huntington's disease _____.
a. undergo progressive deterioration of the nervous system
b. find breathing difficult and suffer frequent lung infections
c. must have frequent transfusions because their blood lacks a clotting factor
d. suffer from a form of aneuploidy

____ 38. The reason a fetus afflicted with phenylketonuria is <u>not</u> affected until after birth is that _____.
a. the child is not bruised or cut during development and therefore does not require a blood-clotting factor
b. prior to birth, the mother's enzyme level prevents accumulation of the dangerous chemical
c. the missing chromosome is compensated for by the mother prior to delivery
d. because the fetus does not breathe, the accumulation of mucus in the lungs is not dangerous

____ 39. In Figure 12-7, the trait shown is _____.

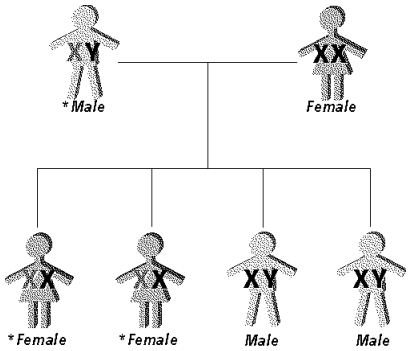


Figure 12-7

a. not sex-linked
b. X-linked
c. Y-linked
d. trisomy

____ 40. What phenotype is depicted in Figure 12-8?

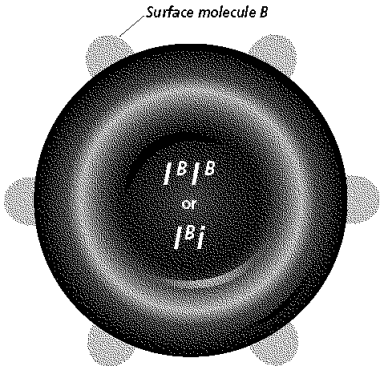


Figure 12-8

a. O
b. AB
c. A
d. B

True/False
Indicate whether the statement is true or false.

____ 41. Traits controlled by more than two alleles are said to have multiple alleles.

____ 42. Multiple alleles can be studied only in individuals.

____ 43. In humans, there are 23 pairs of matching homologous chromosomes called autosomes.

____ 44. Two chromosomes called the sex chromosomes determine the sex of an individual.

____ 45. The sex chromosomes of a human male are XX, and the sex chromosomes of a human female are XY.

____ 46. Traits controlled by genes located on sex chromosomes are called sex-linked traits.

____ 47. The first known example of sex-linked inheritance was discovered in pea plants.

Modified True/False
Indicate whether the statement is true or false. If false, change the identified word or phrase to make the statement true.

____ 48. Differing hormone levels among sexes can cause a single genotype to express more than one <u>phenotype</u>. _____

____ 49. <u>Polygenic</u> inheritance occurs when there are more than two alleles for a single trait. _____

____ 50. <u>More than</u> two phenotypes result from both multiple allelic inheritance and polygenic inheritance. _____

Completion
Complete each statement.

51. Blood groups are a classic example of _____ inheritance in humans.

52. The alleles _____ are always both expressed.

53. The alleles I^A and I^B are _____, meaning they are always both expressed.

54. I^A and I^B are dominant to _____.

55. Blood typing is necessary before a person can receive a _____.

56. A child who inherits I^A from his mother and I^B from his father will have type _____ blood.

57. A child whose parents both have type O blood will have type _____ blood.

58. If a woman with blood type A has a baby with blood type AB, a man with blood type O _____ be the father.

59. Blood tests _____ be used to prove that a certain man is the father of a child.

60. Traits controlled by genes located on the X or Y chromosome are _____.

61. Humans have 22 pairs of _____ type of chromosomes.

62. A graphic representation of an individual's family tree is a(n) _____.

63. The inheritance pattern of a trait controlled by two or more genes is _____.

64. _____ is when the phenotype of the heterozygote is intermediate between those phenotypes expressed by the homozygotes.

65. When phenotypes of both homozygotes are produced in the heterozygote, they are called _____.

Matching

Match each item with the correct statement below.

a. cystic fibrosis
b. simple dominant traits
c. Tay-Sachs disease
d. Huntington's disease
e. phenylketonuria

____ 66. Recessive disorder that results from the absence of an enzyme required to break lipids down
____ 67. Lethal genetic disorder caused by a dominant allele
____ 68. Most common genetic disorder among white Americans
____ 69. Recessive disorder that results from the absence of an enzyme that converts one amino acid into another one
____ 70. Widow's peak and hitchhiker's thumb

Short Answer

71. How does polygenic inheritance differ from Mendelian inheritance?

72. Discuss how the external environment of an organism can affect gene function.

73. Why is it erroneous to believe that a dominant autosomal trait will appear more often in a population than its recessive counterpart?

Name	Mrs. Page	Mr. Page	Mrs. Baker	Mr. Baker	Baby #1	Baby #2
Blood Type	B	AB	B	A	A	O

Table 12-1

74. Two couples, the Pages and the Bakers, had baby boys in the same hospital at the same time. There was a mix-up in the hospital nursery. Use the information given in Table 12-1. Which baby belongs to which family?

75. Based on the Pages' blood types, could either or both babies be theirs? Use Table 12-1 to explain your answer.

76. Based on the Bakers' blood types, could Baby #1 be their child? Could Baby #2 be their child? Use Table 12-1 to explain your answer.

77. Which term does NOT belong with the rest: *Huntington's disease, cystic fibrosis, phenylketonuria, Tay-Sachs disease.* Explain your answer.

The pedigree in Figure 12-6 shows the occurrence of Tay-Sachs disease in a family. Children who were born with the homozygous recessive genotype are not able to produce the enzyme, hexosaminidase A. Without hexosaminidase A, lipids accumulate in nerve cells and damage them. The symptoms usually start to appear a few months after birth. The infant suffers seizures and degeneration of motor and mental skills and dies within the first few years. Scientists believe there is an evolutionary explanation for why the Tay-Sachs allele persists in a population. In Eastern Europe during the early 20th century, tuberculosis was a leading cause of death. Yet, among certain ethnic groups, particularly those with a high incidence of Tay-Sachs disease, few people died of tuberculosis. It appeared as if the presence of the Tay-Sachs allele protected an individual against TB. Individuals with the heterozygous genotype were better able to survive tuberculosis and thus lived to pass the recessive allele along to their offspring. Scientists have determined that the blood serum levels of hexosaminidase A differ in measurable amounts among normal people, carriers, and infants with the disease.

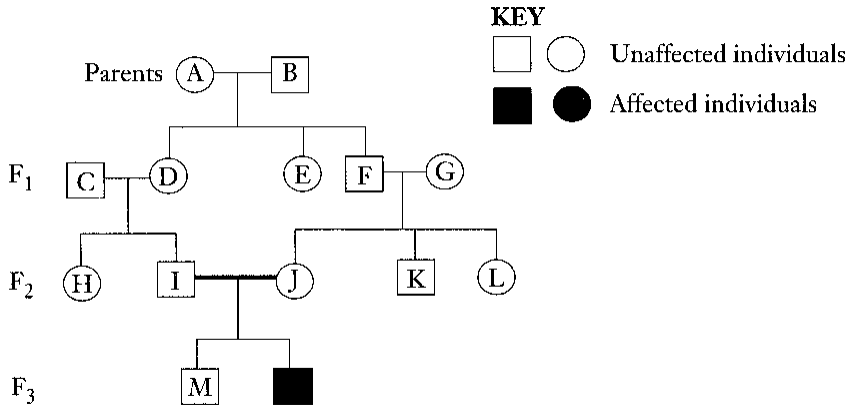


Figure 12-6

78. What is the probability that the next child born to I and J of Figure 12-6 will not be affected?

79. Why is this type of marriage (I and J) more likely to produce individuals with the recessive phenotype than marriages such as those between individuals C and D or between F and G, shown in Figure 12-6?

80. Examine the F_2 generation of Figure 12-6. What is significant about the relationship indicated by the heavy line connecting individuals I and J?

Bio12-Q2W2-Qs Bank-Human Heridity
Answer Section

MULTIPLE CHOICE

1. ANS: B
   Males are represented by squares, and individuals displaying a specific trait are indicated by shading. Therefore, a brother with cystic fibrosis would be represented as a shaded square in the pedigree.

   PTS: 1
2. ANS: D
   Tay-Sachs disease is a recessive disorder found predominantly among populations of Amish and Ashkenazic Jewish people.

   PTS: 1
3. ANS: A
   Huntington's disease is caused by a dominant allele. Therefore, an individual needs only to have one allele in order to display the phenotype. Since the mother will contribute a recessive allele, the only possibility for the offspring to inherit Huntington's disease is by getting the mutant allele from the father. There is a 50% chance of inheriting that allele from the father.

   PTS: 1
4. ANS: D
   Blood type is determined by both alleles possessed by an individual. This individual inherited an A allele from his father and a B allele from his mother. Since both are expressed, giving rise to type AB blood, this is an example of codominance.

   PTS: 1
5. ANS: C
   Traits that display a wide range of variation are often mediated by multiple genes. Such traits are said to be governed by polygenic inheritance.

   PTS: 1
6. ANS: A
   Hemophilia and certain forms of color blindness are inherited as X-linked characteristics.

   PTS: 1
7. ANS: C
   A karyotype reveals the number of chromosomes in cells. Therefore, it would be useful in detecting trisomy, the condition of having three copies of a particular chromosome.

   PTS: 1
8. ANS: B
   PKU, or phenylketonuria, is a disorder in which an individual lacks the enzyme that converts phenylalanine to tyrosine. Therefore, the disease is characterized by a buildup of phenylalanine in the body.

   PTS: 1
9. ANS: D

If a child does not resemble either parent, the trait could not have been inherited via simple dominant heredity.

PTS: 1

10. ANS: B PTS: 1 DIF: B OBJ: 12-4
NAT: C2 | G2 | G3
11. ANS: D PTS: 1 DIF: B OBJ: 12-5
NAT: C2 | G2 | G3
12. ANS: A PTS: 1 DIF: A OBJ: 12-1
NAT: C2 | G1 | G2
13. ANS: D PTS: 1 DIF: B OBJ: 12-1
NAT: C2 | G1 | G2
14. ANS: C PTS: 1 DIF: A OBJ: 12-6
NAT: C2 | G2 | G3
15. ANS: B PTS: 1 DIF: A OBJ: 12-4
NAT: C2 | G2 | G3
16. ANS: D PTS: 1 DIF: A OBJ: 12-4
NAT: C2 | G2 | G3
17. ANS: D PTS: 1 DIF: A OBJ: 12-6
NAT: C2 | G2 | G3
18. ANS: A PTS: 1 DIF: A OBJ: 12-8
NAT: F1 | G1 | G2
19. ANS: C PTS: 1 DIF: A OBJ: 12-1
NAT: C2 | G1 | G2
20. ANS: B PTS: 1 DIF: A OBJ: 12-3
NAT: C2 | F1 | G1
21. ANS: B PTS: 1 DIF: B OBJ: 12-8
NAT: F1 | G1 | G2
22. ANS: A PTS: 1 DIF: B OBJ: 12-8
NAT: F1 | G1 | G2
23. ANS: B PTS: 1 DIF: B OBJ: 12-2
NAT: C2 | G1 | G2
24. ANS: B PTS: 1 DIF: B OBJ: 12-2
NAT: C2 | G1 | G2
25. ANS: A PTS: 1 DIF: B OBJ: 12-2
NAT: C2 | G1 | G2
26. ANS: A PTS: 1 DIF: B OBJ: 12-2
NAT: C2 | G1 | G2
27. ANS: C PTS: 1 DIF: B OBJ: 12-3
NAT: C2 | F1 | G1
28. ANS: A PTS: 1 DIF: B OBJ: 12-3
NAT: C2 | F1 | G1
29. ANS: A PTS: 1 DIF: B OBJ: 12-8
NAT: F1 | G1 | G2
30. ANS: D PTS: 1 DIF: B OBJ: 12-2
NAT: C2 | G1 | G2
31. ANS: A PTS: 1 DIF: B OBJ: 12-9
NAT: F1 | G1 | G2
32. ANS: C PTS: 1 DIF: B OBJ: 12-2

NAT: C2 | G1 | G2

33. ANS: D PTS: 1 DIF: B OBJ: 12-3
NAT: C2 | F1 | G1

34. ANS: A PTS: 1 DIF: B OBJ: 12-8
NAT: F1 | G1 | G2

35. ANS: B PTS: 1 DIF: A OBJ: 12-8
NAT: F1 | G1 | G2

36. ANS: B PTS: 1 DIF: A OBJ: 12-1
NAT: C2 | G1 | G2

37. ANS: A PTS: 1 DIF: B OBJ: 12-3
NAT: C2 | F1 | G1

38. ANS: B PTS: 1 DIF: B OBJ: 12-2
NAT: C2 | G1 | G2

39. ANS: B PTS: 1 DIF: A OBJ: 12-8
NAT: F1 | G1 | G2

40. ANS: D PTS: 1 DIF: A OBJ: 12-9
NAT: F1 | G1 | G2

TRUE/FALSE

41. ANS: T PTS: 1
42. ANS: F PTS: 1
43. ANS: F PTS: 1
44. ANS: T PTS: 1
45. ANS: F PTS: 1
46. ANS: T PTS: 1
47. ANS: F PTS: 1

MODIFIED TRUE/FALSE

48. ANS: T PTS: 1 DIF: B
OBJ: 12-7 NAT: C2 | F4 | G1

49. ANS: F, Multiple allele

PTS: 1 DIF: B OBJ: 12-5 NAT: C2 | G2 | G3

50. ANS: T PTS: 1 DIF: B
OBJ: 12-5 NAT: C2 | G2 | G3

COMPLETION

51. ANS: multiple allelic

PTS: 1

52. ANS: IA and IB

PTS: 1

53. ANS: codominant

PTS: 1

54. ANS: i

PTS: 1

55. ANS: blood transfusion

PTS: 1

56. ANS: AB

PTS: 1

57. ANS: O

PTS: 1

58. ANS: could not

PTS: 1

59. ANS: cannot

PTS: 1

60. ANS: sex-linked traits

PTS: 1 DIF: B OBJ: 12-6 NAT: C2 | G2 | G3

61. ANS: autosome

PTS: 1 DIF: B OBJ: 12-9 NAT: F1 | G1 | G2

62. ANS: pedigree

PTS: 1 DIF: B OBJ: 12-1 NAT: C2 | G1 | G2

63. ANS: polygenic inheritance

PTS: 1 DIF: B OBJ: 12-8 NAT: F1 | G1 | G2

64. ANS: Incomplete dominance

PTS: 1 DIF: B OBJ: 12-4 NAT: C2 | G2 | G3

65. ANS: codominant alleles

PTS: 1 DIF: B OBJ: 12-8 NAT: F1 | G1 | G2

MATCHING

66. ANS: C PTS: 1
67. ANS: D PTS: 1
68. ANS: A PTS: 1
69. ANS: E PTS: 1
70. ANS: B PTS: 1

SHORT ANSWER

71. ANS:
In Mendelian inheritance, traits are determined by dominant and recessive paired alleles of single genes. In polygenic inheritance, a trait is controlled by two or more genes.

PTS: 1 DIF: A OBJ: 12-5 NAT: C2 | G2 | G3

72. ANS:
Temperature, light, nutrition, chemicals, and infectious agents can all influence genes. Examples resulting from differences in temperature include colors in some bacteria and patterns in the coat color of rabbits. Similar phenotypes are controlled by many other genes in organisms.

PTS: 1 DIF: A OBJ: 12-7 NAT: C2 | F4 | G1

73. ANS:
In a given family, a dominant allele that is present will appear more often, on average, than its recessive counterpart. However, often the recessive allele is more abundant in the population, so the number of people born with the dominant trait is low. Examples include polydactyly and Huntington's disease.

PTS: 1 DIF: A OBJ: 12-3 NAT: C2 | F1 | G1

74. ANS:
Baby #2 must belong to the Bakers because only Baby #1 can belong to the Pages.

PTS: 1 DIF: A OBJ: 12-8 NAT: F1 | G1 | G2

75. ANS:
Because Mr. Page is /A/B and Mrs. Page is either /B/B or /B/i, their baby could be either /A/B, /B/B, /Ai, or /Bi; in no case could it be type O (ii). Baby #1 is the only one that could be theirs.

PTS: 1 DIF: A OBJ: 12-8 NAT: F1 | G1 | G2

76. ANS:
Either Baby #1 or Baby #2 could be theirs. If Mrs. Baker is /Bi and Mr. Baker is /Ai or /A/A, then their baby could be /Ai, making it Baby #1. If Mrs. Baker is /Bi and Mr. Baker is /Ai, then their baby could be ii, making it Baby #2.

PTS: 1 DIF: A OBJ: 12-8 NAT: F1 | G1 | G2

77. ANS:
Huntington's disease is the correct answer because it is caused by an autosomal dominant allele, whereas the others are the result of autosomal recessive alleles, or *cystic fibrosis* is the correct answer because all of the others impact on the nervous system, whereas CF does not.

PTS: 1 DIF: A OBJ: 12-3 NAT: C2 | F1 | G1

78. ANS:
The chance that the next child will not be affected is 75%. If two carriers have children, there is a 25% chance the child will be homozygous dominant (not affected), a 50% chance the child will be a carrier (not affected), and a 25% chance of being homozygous recessive (affected).

PTS: 1 DIF: A OBJ: 12-1 NAT: C2 | G1 | G2

79. ANS:
When close genetic relatives marry, there is an increased chance that they could both be unknowing carriers of the recessive allele. The frequency of the gene could become greater in a particular family line than in the population in general.

PTS: 1 DIF: A OBJ: 12-1 NAT: C2 | G1 | G2

80. ANS:
It shows a marriage between first cousins.

PTS: 1 DIF: B OBJ: 12-1 NAT: C2 | G1 | G2