

BioExam 12 & 13

Modified True/False

Indicate whether the statement is true or false.

- ___ 1. Polygenic inheritance occurs when there are more than two alleles for a single trait.
- ___ 2. More than two phenotypes result from both multiple allelic inheritance and polygenic inheritance.
- ___ 3. Many flowering plants such as roses, African violets, and orchids have been produced by the process of hybridization.
- ___ 4. You have benefited from selective breeding by having more agricultural produce than would have been possible otherwise.

Multiple Choice

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

- ___ 5. 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
- ___ 6. A trait controlled by four alleles is said to have _____.
 - A. homologous alleles
 - B. autosomes
 - C. hybridization
 - D. multiple alleles
- ___ 7. The 23rd pair of chromosomes that differ in males and females are called _____.
 - A. autosomes
 - B. sex chromosomes
 - C. multiple alleles
 - D. polygenes

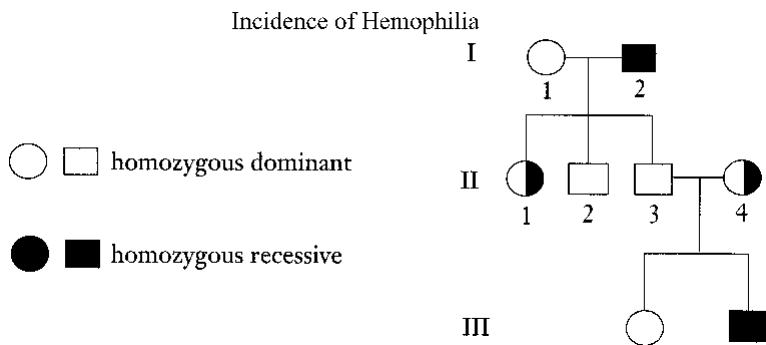
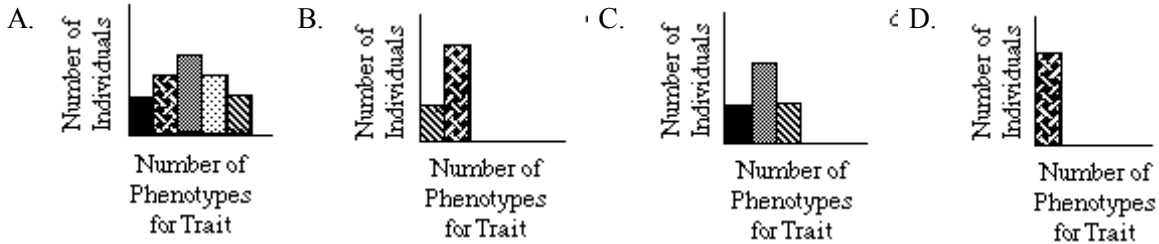


Figure 12-1

- ___ 8. 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%
- ___ 9. What type of inheritance pattern does the trait represented by the shaded symbols in Figure 12-1 illustrate?
 - A. incomplete dominance
 - B. multiple alleles
 - C. codominance
 - D. sex-linked

10. 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
11. What is the relationship between individual I-1 and individual III-2 in Figure 12-1?
- A. grandfather-granddaughter
B. grandmother-grandson
C. great aunt-nephew
D. mother-son
12. If a female fruit fly heterozygous for red eyes ($X^R X^r$) crossed with a white-eyed male ($X^r Y$), what percent of their offspring would have white eyes?
- A. 0%
B. 25%
C. 50%
D. 75%
13. 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
14. Which of the bar graphs shown below represents what the phenotypic frequencies might be for polygenic inheritance?



15. Because the gene for red-green color blindness is located on the X chromosome, it is normally not 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

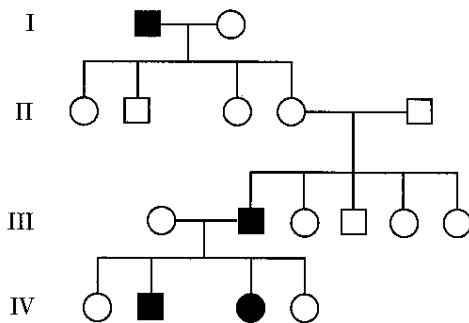


Figure 12-3

16. 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
17. Based on Figure 12-3, what do you know about individual III-1's mother?
- A. She had the trait.
C. She was homozygous recessive.

- B. She was a carrier. D. She was homozygous dominant.
- ___ 18. According to the pedigree in Figure 12-3, how many of the **offspring** in the III generation show the **normal** trait?
A. 1 C. 4
B. 2 D. 5
- ___ 19. Eye color in humans is the result of _____ inheritance.
A. multiple allelic C. sex-linked
B. polygenic D. simple dominant
- ___ 20. Royal hemophilia is the result of _____ inheritance.
A. multiple allelic C. sex-linked
B. polygenic D. simple dominant
- ___ 21. The blood types A, B, AB, and O are the result of _____ inheritance.
A. multiple allelic C. sex-linked
B. polygenic D. simple dominant
- ___ 22. 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.
- ___ 23. Cystic fibrosis and Tay-Sachs disease are typical of recessive disorders concentrated in _____.
A. ethnic groups C. countries with hot, wet climates
B. families with a single child D. the United States
- ___ 24. Most human genetic disorders are caused by the expression of _____.
A. recessive alleles C. one dominant allele
B. two dominant alleles D. sex-linked heredity
- ___ 25. A phenotype that results from a dominant allele must have at least _____ dominant allele(s) present in the parent(s).
A. one C. three
B. two D. four
- ___ 26. 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 _____.

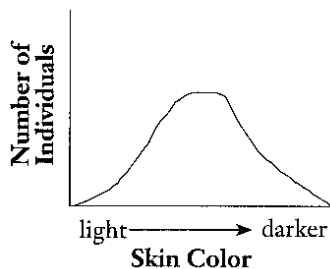


Figure 12-4

- A. height C. number of fingers and toes
B. blood type D. incidence of cystic fibrosis
- ___ 27. 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 C. physical therapy
B. periodic blood transfusions D. dietary adjustments

- _____ 28. 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
- _____ 29. A human genetic disorder caused by a dominant gene is _____.
A. Tay-Sachs disease
B. cystic fibrosis
C. phenylketonuria
D. Huntington's disease
- _____ 30. 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%
- _____ 31. 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
- _____ 32. Both hemophilia and red-green color blindness are _____.
A. inherited only from the mother
B. located on the Y chromosome
C. caused by a dominant gene
D. sex-linked conditions
- _____ 33. An application of using DNA technology to help environmental scientists would be _____.
A. use PCR to analyze DNA at a crime scene
B. create a tobacco plant that glows in the dark
C. clone the gene for human growth hormone to treat pituitary dwarfism
D. make transgenic bacteria that can be used to clean up oil spills more quickly than do the natural bacteria
- _____ 34. Which of the following would be an example of gene therapy technology?
A. development of a nasal spray that contains copies of the normal gene that is defective in persons with cystic fibrosis
B. cutting DNA into fragments with restriction enzymes
C. modifying *E. coli* to produce indigo dye for coloring denim blue jeans
D. separation DNA fragments using gel electrophoresis
- _____ 35. Gel electrophoresis is a technique used to _____.
A. clone chromosomes of various species
B. cut DNA into fragments of various sizes
C. separate DNA fragments by length
D. inject foreign DNA into animal and plant cells
- _____ 36. A small amount of DNA obtained from a mummy or from frozen remains of a human may be cloned. In order to clone small amounts of DNA, _____ needs to be used to generate larger quantities of the DNA.
A. polymerase chain reaction techniques
B. gel electrophoresis
C. DNA fingerprinting
D. gene splicing
- _____ 37. In 1974, Stanley Cohen and Herbert Boyer inserted a gene from an African clawed frog into a bacterium. The bacterium produced the protein coded for by the inserted frog gene. The bacterium containing functional frog DNA would be classified as a _____.
A. clone
B. DNA fingerprint
C. plasmid
D. transgenic organism

- ___ 38. Listed below are procedures involved in the production of a transgenic organism. From the choices provided, select the sequence that represents the proper order of events.
1. Recombinant DNA is transferred into a bacterial cell.
 2. A specific gene is identified in a DNA sequence.
 3. The DNA fragment is recombined into a vector.
 4. The DNA fragment to be inserted is isolated.
- A. 1, 2, 3, 4
B. 2, 3, 1, 4
C. 2, 4, 3, 1
D. 4, 1, 2, 3
- ___ 39. The Human Genome Project has involved sequencing and mapping the human genome. The most important benefit of this information has been the diagnosis of genetic disorders. Once a genetic disorder is diagnosed, _____ can be used as a possible treatment.
- A. cell cultures
B. gene therapy
C. DNA fingerprinting
D. PCR
- ___ 40. The effort to completely map and sequence the human genome resulted in knowing the sequence of the approximately _____ genes on the 46 human chromosomes.
- A. 46
B. 5,000
C. 23,000
D. 3 billion
- ___ 41. Which of the following are applications of genetic engineering?
- A. transgenic bacteria in agriculture
B. transgenic plants and animals
C. transgenic bacteria in industry
D. all of these

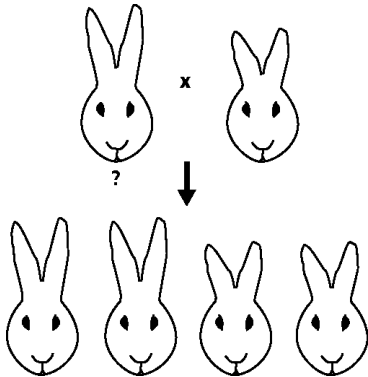


Figure 13-4

- ___ 42. What is the genotype of the unknown rabbit in Figure 13-4?
- A. homozygous long ears
B. homozygous short ears
C. heterozygous
D. recessive
- ___ 43. What would be the result of the test cross in Figure 13-4 if the unknown were homozygous long ears?
- A. 1/2 of the offspring would have long ears
B. all of the offspring would have long ears
C. all of the offspring would have short ears
D. 1/4 of the offspring would have short ears
- ___ 44. According to Figure 13-7, which DNA sequence will be cleaved by EcoRI, which cuts AATT/TTAA?



Figure 13-7

- A. A
B. B
C. C
D. D

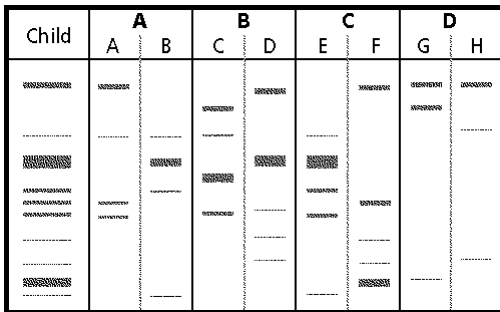


Figure 13-8

- ___ 45. According to Figure 13-8, which are the parents of the child?
A. A
B. B
C. C
D. D
- ___ 46. According to Figure 13-8, which parents might give a false positive if only the longer DNA fragments were analyzed?
A. A
B. B
C. C
D. D

Completion

Complete each statement.

47. Humans have 22 pairs of _____ type of chromosomes.
48. A gene gun and a virus may both be classified as _____ because they are mechanisms by which foreign DNA may be transferred into a host cell.
49. A(n) _____ shows the relative location of genes on a chromosome.
50. A(n) _____ is a small ring of DNA found in a bacterial cell.

51. _____ are used to cleave DNA into fragments.
52. _____ is used to develop pure breeds.

Short Answer -- CHOOSE ANY THREE TO ANSWER. ONLY THE FIRST THREE ANSWERED WILL BE GRADED

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

Table 12-1

53. 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? Explain.
54. How does incomplete dominance differ from multiple alleles?
55. Discuss how the external or internal environment of an organism can affect gene function.
56. What is the genetic reason for Down syndrome? Discuss the results.
57. Why is it erroneous to believe that a dominant autosomal trait will appear more often in a population than its recessive counterpart?
58. Discuss how DNA fingerprinting works in crime analysis.
59. How might the Human Genome Project provide important information for diagnosis of genetic disorders?
60. A breeder wants to find out whether or not a certain golden retriever is a carrier of an undesirable recessive trait. What could the breeder do? Explain.