





**Biology Standard 3 (All elements)**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

1. Mendel's discovery that characteristics are inherited due to the transmission of hereditary factors resulted from his
  - A. careful microscopic examinations of genes and chromosomes
  - B. dissections to determine how fertilization occurs in pea plants
  - C. breeding experiments with many generations of fruit flies
  - D. analysis of the offspring produced from many pea plant crosses
  
2. All the heritable genes found in a population constitute the population's
  - A. recessive alleles
  - B. chromosome mutations
  - C. homologous structures
  - D. gene pool
  
3. Which genetic concept was proposed by Mendel?
  - A. chromosome nondisjunction
  - B. independent assortment
  - C. multiple alleles
  - D. sex linkage

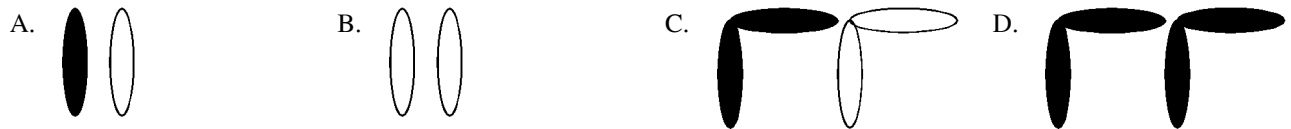
4. Two genes are linked if they are
  - A. located on separate sex chromosomes
  - B. members of an allelic pair
  - C. located on the same chromosome
  - D. able to segregate at random
  
5. Pairs of genes that control the same trait are known as
  - A. alleles
  - B. gametes
  - C. hybrids
  - D. loci
  
6. Allelic pairs of genes are located only
  - A. on homologous pairs of chromosomes
  - B. in a DNA nucleotide
  - C. in organisms that are homozygous
  - D. on nonhomologous chromosomes
  
7. In humans there are 23 pairs of chromosomes. One pair of the 23 are sex chromosomes. The other 22 pairs are known as
  - A. autosomes
  - B. homozygotes
  - C. heterozygotes
  - D. centrosomes

8.	CHROMOSOME THAT CARRIES THE DOMINANT ALLELE FOR HEIGHT	
	CHROMOSOME THAT CARRIES THE RECESSIVE ALLELE FOR HEIGHT	
	CHROMOSOME THAT CARRIES THE DOMINANT ALLELE FOR SEED SHAPE	
	CHROMOSOME THAT CARRIES THE RECESSIVE ALLELE FOR SEED SHAPE	

Which statement correctly describes the location of the alleles for height and seed shape?

- A. The dominant alleles for height and seed shape are located on the same chromosome.
- B. The dominant and recessive alleles are located on the same member of a homologous pair of chromosomes.
- C. The alleles for height are located on a different homologous pair of chromosomes than the alleles for seed shape.
- D. The dominant alleles are located on one pair of homologous chromosomes and the recessive alleles are located on another pair of homologous chromosomes.

9. Which diagram represents those chromosomes that are responsible for the heterozygous genotype for height?



10. The basic principles of genetics were established in the 19th century by
- A. Francis Crick
  - B. Charles Darwin
  - C. Jean Lamarck
  - D. Gregor Mendel

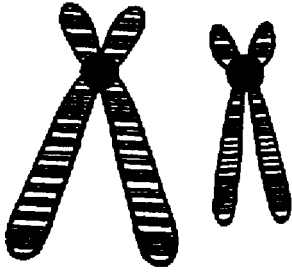
11. Mendel developed his basic principles of heredity by
- A. microscopic study of chromosomes and genes
  - B. breeding experiments with drosophila
  - C. mathematical analysis of the offspring of pea plants
  - D. ultracentrifugation studies of cell organelles

12. While working with pea plants, Gregor Mendel observed that some tall plants had yellow seeds while other tall plants had green seeds. This observation is best explained by
- A. nondisjunction of chromosomes
  - B. linkage of genes
  - C. independent assortment
  - D. intermediate inheritance

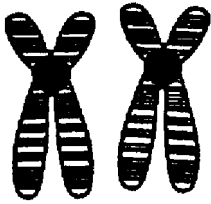
13. What is a definition of the term "gene"?
- A. three messenger-RNA nucleotides coded for a specific amino acid
  - B. the number of nitrogenous bases in a nucleotide
  - C. a transfer-RNA nucleotide sequence specific for a particular amino acid
  - D. a sequence of nucleotides that directs the synthesis of a product, such as a protein

14. Which diagram represents a pair of homologous chromosomes?

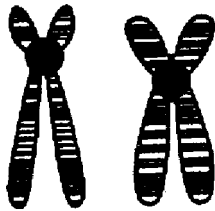
A.



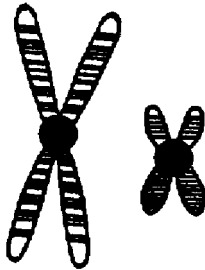
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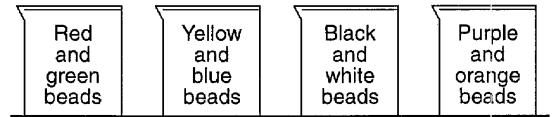
C.



D.



15. The diagram represents four beakers, each containing an equal number of two colors of beads. One bead was removed at random from each of the four beakers, and the colors were recorded. The beads were then returned to the original beakers. When the procedure was repeated several times, different combinations of colored beads were obtained. This activity could best be used to illustrate

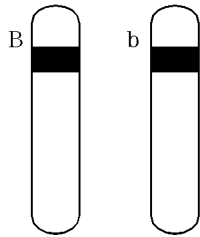


- A. mitotic cell division
- B. sex linkage
- C. crossing-over
- D. independent assortment

16. Homologous pairs of chromosomes are restored as a result of

- A. gametogenesis
- B. fertilization
- C. germination
- D. differentiation

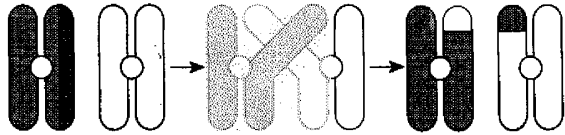
17. The diagram shown represents a pair of homologous autosomes. The letters *B* and *b* represents genes for a certain trait. These letters also represent



- A. an allelic pair of genes  
B. linked genes  
C. genes for sex determination  
D. homozygous genes
18. Which statement best describes chromosomes that contain genes for the same characteristics?
- A. They are present in a normal gamete.  
B. They are homologous.  
C. They occur in the same monoploid cell.  
D. They are linked.

19. Which concept is *not* associated with the work of Gregor Mendel?
- A. dominance  
B. use and disuse  
C. independent assortment  
D. segregation
20. Mendel developed the basic principles of heredity by
- A. examining chromosomes with microscopes  
B. using X rays to induce mutations  
C. analyzing large numbers of offspring  
D. observing crossing-over during meiosis
21. Which statement describes the work of Gregor Mendel?
- A. He developed some basic principles of heredity without having knowledge of chromosomes.  
B. He explained the principle of dominance on the basis of the gene-chromosome theory.  
C. He developed the microscope for the study of genes in pea plants.  
D. He used his knowledge of gene mutations to help explain the appearance of new traits in organisms.

22. Which process is illustrated by the diagram shown?



- A. crossing-over
- B. nondisjunction
- C. sex determination
- D. independent assortment

23. A normal body cell of a fruit fly contains eight chromosomes. Each normal gamete of this organism contains only four chromosomes, as a result of the process of

- A. binary fission
- B. vegetative propagation
- C. germination
- D. meiosis

24. Which method was used by Gregor Mendel to develop the principles of dominance and segregation?

- A. mathematical analysis of pea plant crosses
- B. microscopic study of pea plant chromosomes
- C. study of mutagenic agents affecting pea plants
- D. chemical analysis of pea plant DNA

25. Scientific investigation of human genetics has been limited because

- A. humans have a long life cycle and few offspring
- B. the principles of genetics do not appear to apply to humans
- C. genetic counseling has not been applied to humans
- D. environmental factors limit the number of mutations in humans

26.  $F$  represents the gene for brown coat color and  $f$  represents the gene for white coat color. In the cross  $FF \times ff$ , all the offspring have a brown coat. Which genetic principle is illustrated by this cross?

- A. crossing-over
- B. multiple alleles
- C. codominance
- D. dominance

27. In a certain type of plant, tall is dominant over short, and green seed coat is dominant over yellow seed coat. When two plants heterozygous for both of these traits are crossed, the offspring produced are tall, with green seed coats; tall, with yellow seed coats; short, with green seed coats; and short, with yellow seed coats. The results of this cross illustrate

- A. vegetative propagations
- B. mutagenic agents
- C. intermediate inheritance
- D. independent assortment

28. Which mutation could be passed on to future generations?
- a gene change in a liver cell
  - cancer caused by excessive exposure of skin cells to the Sun
  - a chromosomal alteration during gametogenesis
  - random breakage of a chromatid in a leaf cell of a maple tree

29. Which cross could produce a child with blood type A?

- $I^A i \times ii$
- $I^A I^A \times I^B I^B$
- $I^A i \times I^B I^B$
- $I^B I^B \times ii$

30. The greatest degree of genetic variation would be found in offspring that result from

- binary fission
- fertilization
- regeneration
- grafting

31. Base your answer(s) to the following question(s) on the information and diagram below and on your knowledge of biology.

In cats, gene  $E$  produces yellow fur and gene  $B$  produces black fur. A cat that inherits both of these genes has patches of yellow and black fur and is known as a calico. The alleles for black or yellow are located on the  $X$ -chromosome. The cross  $X^B Y \times X^B X^E$  is illustrated in the square below.

	$X^B$	$Y$
$X^B$	①	②
$X^E$	③	④

Yellow male offspring are represented by

- 1
- 2
- 3
- 4

32. In pea plants, the gene for tallness ( $T$ ) is dominant over the gene for shortness ( $t$ ). If 100% of the  $F_1$  generation offspring are heterozygous tall, what were the most probable genotypes of the parent plants?

- $Tt \times Tt$
- $Tt \times tt$
- $TT \times Tt$
- $TT \times tt$

33. In a certain species of meadowmouse, dark coat color is dominant over cream coat color. If heterozygous dark-coated male mice are mated with cream-coated female mice, what would be the expected percentage of phenotypes in their offspring?

- A. 25% dark coated, 75% cream coated
- B. 50% dark coated, 50% cream coated
- C. 75% dark coated, 25% cream coated
- D. 100% dark coated

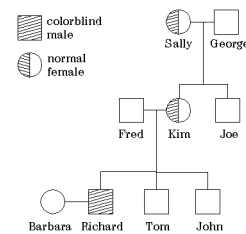
34. A trait which produces green pods is crossed with a pea plant which produces yellow pods. The resulting offspring had green pods. With respect to pod color, the genotype of the offspring is most likely

- A. heterozygous dominant
- B. pure recessive
- C. homozygous dominant
- D. homozygous recessive

35. A pea plant which produces green pods is crossed with a pea plant which produces yellow pods. The resulting offspring had green pods. With respect to pod color, the genotype of the offspring is most likely

- A. heterozygous dominant
- B. pure recessive
- C. homozygous dominant
- D. homozygous recessive

36. Shown is a pedigree chart. The chart shows that Sally is a carrier for red-green color blindness.



Which is most likely the chromosomal makeup of George's body cells?

- A. 11 pairs of autosomes and one X-chromosome
- B. 11 pairs of autosomes and one Y-chromosome
- C. 22 pairs of autosomes and two X-chromosomes
- D. 22 pairs of autosomes, an X-chromosome, and a Y-chromosome

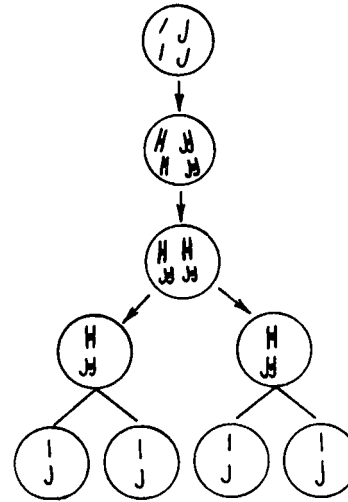


37. What is the probability that Barbara, who has no genes for color blindness, will have a colorblind daughter?
- A. 0%    B. 25%    C. 50%    D. 100%
38. Which statement best describes Sally?
- A. She has no genes for color blindness.
- B. She has one gene for color blindness located on an X-chromosome.
- C. She has one gene for color blindness located on a Y-chromosome.
- D. She has two genes for color blindness.
39. Richard is colorblind because he inherited the trait from his
- A. father, Fred                      B. grandfather, George
- C. mother, Kim                        D. uncle, Joe
40. In a species of corn, the diploid number of chromosomes is 20. What is the number of chromosomes found in each of the normal egg cells produced by this species?
- A. 5            B. 10            C. 20            D. 40
41. In cabbage butterflies, white color ( $W$ ) is dominant and yellow color ( $w$ ) is recessive. If a pure white cabbage butterfly mates with a yellow cabbage butterfly, all the resulting ( $F_1$ ) butterflies are heterozygous white. Which cross represents the genotypes of the parent generation?
- A.  $Ww \times ww$                       B.  $WW \times Ww$
- C.  $WW \times ww$                       D.  $WW \times Ww$
42. Which basic genetic concept states that chromosomes are distributed to gametes in a random fashion?
- A. dominance                      B. linkage
- C. segregation                      D. mutation
43. When a mouse with black fur is crossed with a mouse with white fur, all  $F_1$  generation offspring have grey fur. Which phenotypic results can be expected in the  $F_2$  generation?
- A. 100% grey
- B. 25% black, 75% white
- C. 50% black, 50% white
- D. 25% black, 50% grey, 25% white

44. There are multiple alleles for the ABO blood group. Why are there only two of these alleles normally present in any one individual?
- There are not enough nucleotides in a red blood cell to produce a third allele.
  - Each parent contributes only one allele for the ABO blood group to the offspring.
  - Each allele in the ABO group must be either dominant or recessive.
  - Blood group alleles are not segregated during meiosis.

45. Traits controlled by genes on the X-chromosome are said to be
- sex-linked
  - incompletely dominant
  - homozygous
  - mutagenic

46. Which process is represented by the diagram shown?



- germination
  - fertilization
  - mitotic cell division
  - meiotic cell division
47. A cross between two tall garden pea plants produced 314 tall plants and 98 short plants. The genotypes of the tall parent plants were most likely
- $TT$  and  $tt$
  - $TT$  and  $Tt$
  - $Tt$  and  $Tt$
  - $TT$  and  $TT$

48. If two roan cattle are crossed, what percent of the offspring are expected to show the parental phenotype for coat color?
- A. 25%    B. 50%    C. 75%    D. 100%
49. A man who has blood type AB marries a woman who has blood type B. This couple would *not* normally have a child with which genotype?
- A.  $I^A i$     B.  $I^B I^B$     C.  $I^A B^B$     D.  $ii$
50. When a colorblind woman marries a male with normal vision, all their daughters have normal vision and all their sons are colorblind. This is an example of which type of inheritance?
- A. multiple alleles  
B. codominance  
C. sex linkage  
D. autosomal dominance
51. Occasionally during meiosis, a single homologous chromosome pair may fail to separate. A human gamete produced by such a nondisjunction would have a chromosome number of
- A. 23    B. 24    C. 25    D. 26
52. All the heritable alleles of a population are known as the
- A. geographic distribution  
B. homologous structure  
C. gene pool  
D. sexual recombinants
53. In a fruit fly in which the diploid number of chromosomes is 8, the chromosome number in each gamete is normally
- A. 16    B. 2    C. 8    D. 4
54. In pea plants, the allele for tallness is dominant over the allele for shortness. Tall pea plants are crossed with short pea plants, and the cross results in 271 tall plants and 268 short plants. Based on this cross the genotype of the parental tall pea plants can be correctly described as
- A. homozygous    B. heterozygous  
C. pure recessive    D. pure dominant
55. What percent of the male offspring produced by a father with normal vision and a colorblind mother are expected to be colorblind?
- A. 0%    B. 33%    C. 75%    D. 100%

56. Which is the result of normal meiosis and fertilization in humans?

- A. multiple alleles
- B. new gene combinations
- C. a chromosome number of 92
- D. a polyploid condition

57. When red coat cattle ( $C^R C^R$ ) are crossed with white coat cattle ( $C^W C^W$ ), all the offspring are roan coat. How many different genotypes can be produced when these roan coat cattle are crossed with white coat cattle?

- A. 1
- B. 2
- C. 3
- D. 4

58. During egg cell production in a human female, the 21st pair of chromosomes may fail to separate. This failure to separate is known as

- A. crossing-over
- B. gene mutation
- C. polyploidy
- D. nondisjunction

59. In cats, the gene for short hair ( $A$ ) is dominant over the gene for long hair ( $a$ ). A short-haired male cat is mated with a long-haired female, and four kittens are produced, two short-haired and two-longhaired. The genotypes of the parent cats are most probably

- A.  $Aa \times aa$
- B.  $AA \times Aa$
- C.  $Aa \times Aa$
- D.  $AA \times aa$

60. Which factor tends to keep the gene pool constant in a population?

- A. migration
- B. mutation
- C. random mating
- D. changes in climate

61. If there are 40 chromosomes in each body cell of an organism, what is the total number of chromosomes normally present in a gamete produced by that organism?

- A. 10
- B. 20
- C. 40
- D. 80

62. In cattle, black color is dominant over red color. Which statement describes the offspring produced when a homozygous black bull is mated with several red cows?

- A. 100% of the offspring will be red.
- B. 100% of the offspring will be black.
- C. 75% of the offspring will be black and 25% will be red.
- D. 50% of the offspring will be black and 50% will be red.

63. White mice with fluffy (tufted) tails are mated with brown mice with hairless tails. In the  $F_2$  generation, some of the white offspring have hairless tails, while some of the brown offspring have tufted tails. These results best demonstrate

- A. independent assortment
- B. sex linkage
- C. gene mutation
- D. intermediate inheritance

64. The letters in the following crosses represent parental blood types. Which cross could produce offspring that represent all four blood types of the ABO blood group?

- A.  $I^A I^A \times I^A I^B$
- B.  $ii \times I^A i$
- C.  $I^A I^B \times I^A I^B$
- D.  $I^A i \times I^B i$

65. Synapsis and disjunction are processes directly involved in

- A. mitotic cell division
- B. meiotic cell division
- C. fertilization
- D. fission

66. Two mice with black fur were crossed and produced offspring with brown fur and offspring with black fur. If  $B$  represents the dominant allele for black fur, which would represent the most probable genotypes of the parental mice?

- A.  $BB \times Bb$
- B.  $BB \times BB$
- C.  $Bb \times Bb$
- D.  $BB \times bb$

67. The chances of a  $YY$  chromosome combination occurring in humans as a result of normal meiotic division and normal gametic fusion is

- A. 0%
- B. 25%
- C. 50%
- D. 100%

68. The best way to determine the coat-color phenotype of a guinea pig is to

- A. X-ray the animal
- B. prepare a chromosome slide
- C. analyze a blood sample
- D. observe the organism

69. A cross of a red cow with a white bull produces all roan offspring. This type of inheritance is known as

- A. codominance
- B. mutation
- C. sex linkage
- D. multiple alleles

70. A woman carrying the gene for hemophilia marries a man who is a hemophiliac. What percentage of their children can be expected to have hemophilia?

- A. 0%
- B. 50%
- C. 75%
- D. 100%

71. The process by which homologous chromosomes exchange segments of DNA is

- A. segregation
- B. crossing-over
- C. fertilization
- D. independent assortment

72. The egg cells of a species are most similar to the sperm cells of that species in their

- A. degree of motility
- B. amount of stored food
- C. chromosome number
- D. shape and size

73. Observations that both tall pea plants and short pea plants can produce either yellow seeds or green seeds led to the development of the genetic concept known as

- A. nondisjunction
- B. dominance
- C. independent assortment
- D. intermediate inheritance

74. When a radish plant with smooth leaf margins was crossed with a plant with toothed leaf margins, all the  $F_1$  offspring had wavy leaf margins. The  $F_1$  plants were crossed. Out of 100  $F_2$  plants, how many could be expected to have toothed leaf margins?

- A. 25      B. 50      C. 75      D. 100

75. When two organisms that are heterozygous for a trait are crossed, the percentage of offspring expected to show the recessive trait would most likely be

- A. 100%    B. 75%    C. 50%    D. 25%

76. In guinea pigs, black coat color ( $B$ ) is dominant over white coat color ( $b$ ). When two black guinea pigs were mated, the ratio of black-coated offspring to white-coated offspring was 3:1. In this cross, the parental genotypes were most likely

- A.  $Bb \times Bb$                       B.  $BB \times bb$   
C.  $Bb \times bb$                       D.  $BB \times Bb$

77. In a certain species of mice, brown fur is dominant over white fur and long tails are dominant over short tails. Both of these traits are inherited independently of each other. With respect to only these traits how many different phenotypes would be present in a large population of mice?

- A. 1      B. 2      C. 3      D. 4

78. A person with type O blood marries a person with type AB blood. Possible blood genotypes of their children are

- A.  $I^A i$  and  $I^B I^B$                       B.  $I^B I^B$  and  $I^A I^A$   
C.  $I^A i$  and  $I^B i$                       D.  $I^A I^B$  and  $ii$

79. Which represents the genotype of a homozygous condition?

- A.  $Bb$       B.  $BC$       C.  $bb$       D.  $bc$

80. What percentages can be expected in the offspring of a cross between a female carrier for color blindness and a male with normal color vision?
- 25% normal males, 25% colorblind males, 25% normal females, 25% carrier females
  - 25% normal males, 25% colorblind males, 25% carrier females, 25% colorblind females
  - 75% normal males, 25% carrier females
  - 50% colorblind males, 50% colorblind females

81. During synapsis, chromatids in homologous pairs of chromosomes often twist around each other, break, exchange segments, and rejoin. This process usually contributes to
- the formation of polyploid offspring
  - nondisjunction of homologous chromosomes
  - the production of identical twins
  - increased variability in offspring

82. The diagram represents the nucleus in a zygote of a particular species. How many chromosomes are normally found in an egg cell produced by this species?
- 8
  - 2
  - 23
  - 4



83. In guinea pigs, black coat color ( $B$ ) is dominant over white ( $b$ ). Two black guinea pigs are mated. Most of the offspring are black but some are white.

The cross described illustrates the principle of

- dominance
  - nondisjunction
  - condominance
  - sex linkage
84. The genotypes for coat color of the parent guinea pigs are probably
- $BB$  and  $BB$
  - $bb$  and  $bb$
  - $BB$  and  $Bb$
  - $Bb$  and  $Bb$
85. Color blindness is a sex-linked trait carried on the  $X$ -chromosome. If a colorblind woman marries a man with normal vision, which will most probably be true of their children?
- All of their sons will be colorblind and all of their daughters will have normal vision.
  - All of the sons and daughters will be colorblind.
  - About half of their sons and half of their daughters will be colorblind.
  - All of their daughters will be colorblind and all of their sons will have normal vision.



86. A woman with blood genotype  $I^A i$  marries a man with blood genotype  $I^B i$ . What is the probability that they will have a child with type O blood?

- A. 1/1    B. 1/2    C. 1/3    D. 1/4

87. What is the normal number of chromosomes in a human zygote?

- A. 23    B. 24    C. 46    D. 48

88. Which sequence represents the process of meiosis?

- A.  $n \rightarrow n$                       B.  $2n \rightarrow n$   
C.  $n \rightarrow 2n$                       D.  $2n \rightarrow 2n$

89. The gamete produced in the ovary of an animal is the

- A. egg cell                      B. sperm cell  
C. spore                          D. zygote

90. If heterozygous black guinea pigs are mated with each other, what percentage of the offspring will be expected to have the same genotype for coat color as their parents

- A. 100%    B. 75%    C. 50%    D. 0%

91. Fruit flies that have gray bodies usually have long wings. What is the most probable reason for the inheritance of this combination of characteristics?

- A. The genes for these traits are linked on the same chromosome.  
B. Both traits are determined by codominant genes.  
C. The traits are inherited independently of each other.  
D. Nondisjunction occurs in more than one pair of chromosomes.

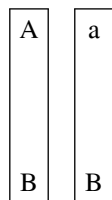
92. A couple had four children. Each child had a different blood type in the ABO group. The genotypes of the parents were most probably

- A.  $I^A I^B \times I^A I^B$                       B.  $I^A I^B \times I^A i$   
C.  $I^A i \times ii$                           D.  $I^A i \times I^B i$

93. Gregor Mendel developed some basic principles of heredity based on his
- dissection of the flowers of both tall and short African violet plants
  - microscopic observation of the nuclei of fruit fly cells
  - biochemical analysis of DNA produced in the  $F_2$  generations of roan cattle
  - mathematical analysis of the offspring produced by crossing pea plants

94. The diagram shown represents a pair of homologous chromosomes. Which allelic combination represents the heterozygous condition for a trait?

- $Aa$
- $BB$
- $AB$
- $aB$



95. Nondisjunction of the sex chromosomes of a human female during meiosis may result in her daughter inheriting a condition represented by
- $YY$
  - $XXX$
  - $XY$
  - $XYY$

96. In poultry, feather shank ( $F$ ) is dominant over clean shank ( $f$ ). If the hen's genotype is represented by  $ff$  and the rooster's genotype is  $Ff$ , what percentage of their offspring would be expected to have feathered shanks?

- 0%
- 50%
- 75%
- 100%

97. A man with normal color vision married a woman with normal color vision whose father was colorblind. Their chance of having a colorblind daughter is

- 0%
- 25%
- 75%
- 100%

98. Which is an example of environmental influence on gene expression?

- the production of plants bearing oval squash from parent plants bearing round and long squash
- the effect of light on chlorophyll production in plants
- the pattern of inheritance for sex-linked traits in humans
- the production of human offspring with blood type AB

99. The crossing of two heterozygous tall pea plants usually produces offspring in a 1:2:1 genotypic ratio for height. This result best illustrates the genetic concept of

- A. dominance
- B. segregation
- C. independent assortment
- D. codominance

100. Hereditary information for most traits is generally located in

- A. genes found on chromosomes
- B. chromosomes found on genes
- C. the mitochondria of gametes
- D. the lysosomes in the cytoplasm

101. The failure of homologous chromosomes to separate from each other is known as

- A. crossing-over
- B. disjunction
- C. nondisjunction
- D. synapsis

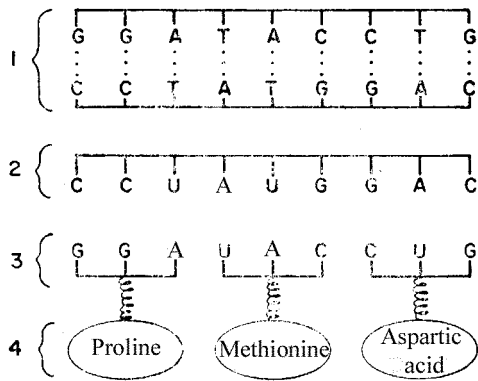
102. A man who has blood type A and a woman who has blood type B have a child who had blood type O. The best explanation for this is that

- A. both parents are heterozygous for their blood type
- B. the woman is homozygous recessive for her blood type
- C. the alleles for blood type O are dominant over the alleles for the blood type A and B
- D. blood type O is produced when the alleles represented by  $I^A$  and  $I^B$  are combined

103. In sheep, the allele for white wool is dominant over that for black wool. If a heterozygous white ram is mated to a black ewe, what will be the most likely distribution of color in their offspring?

- A. 50% white, 50% black
- B. 75% white, 25% black
- C. 100% black
- D. 100% white

104. The molecule that produces chromatids when it replicates is represented by



- A. 1      B. 2      C. 3      D. 4

105. Gregor Mendel developed some basic principles of heredity by

- A. studying sex-linked traits and mutations
- B. mathematically analyzing crosses of pea plants
- C. studying the mating of fruit flies
- D. counting genes and chromosomes

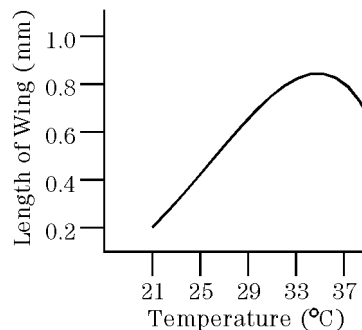
106. If a man has type B blood and his sister has type A blood, which combination represents the genotypes of their parents?

- A. type O father and a homozygous A mother
- B. type O father and a homozygous B mother
- C. type AB father and type O mother
- D. both mother and father with type O blood

107. In summer squash, white-colored fruit is dominant over yellow-colored fruit. If homozygous yellow-fruited plants are crossed with heterozygous white-fruited plants, what is the expected percentage of fruit color produced in the offspring?

- A. 100% yellow
- B. 100% white
- C. 50% yellow, 50% white
- D. 25% yellow, 75% white

108. The information in the graph shown was obtained from fruit flies that were all homozygous recessive for shriveled wings. What is the best interpretation of the observed results?



- A. Higher temperatures always produce longer wings.
- B. The environment affects gene expression.
- C. Lower temperatures produce larger wings.
- D. Environmental change always produces recessive genes.

109. The chromosome number of a cell produced by mitotic cell division is represented by  $2n$ . If that cell had been produced by meiotic cell division, its chromosome number would be represented by

- A.  $\frac{n}{2}$       B.  $n$       C.  $2n$       D.  $4n$

110. When Mendel was experimenting with pea plants, he noted that the traits for seed color and plant height were inherited separately. This observation most directly contributed to an understanding of

- A. codominance  
B. dominance  
C. independent assortment  
D. intermediate inheritance

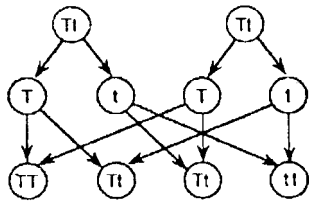
111. The following data tables summarize the results of an experiment using primroses grown under different conditions of temperature and relative humidity. Which conclusion could be drawn from these data tables?

- A. Color in primroses is caused by gene linkage.  
B. Many characteristics are not inherited.  
C. Crossing-over occurs only when plants are grown at higher temperatures.  
D. There is an interaction between environment and heredity.

Temperature: 20° C Relative humidity: 20%	
Genotype	Phenotype
AA	red
Aa	red
aa	white

Temperature: 31° C Relative humidity: 95%	
Genotype	Phenotype
AA	white
Aa	white
aa	white

112. The diagram shown represents the inheritance of stem height in garden peas. The diagram best illustrates



- A. intermediate inheritance
- B. segregation and recombination
- C. sex linkage and codominance
- D. independent assortment

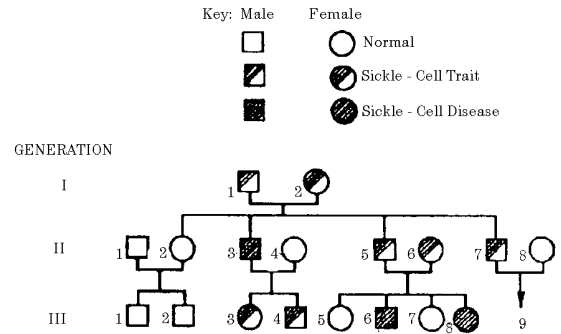
113. What are the possible blood types of the children of a man with blood type A and a woman with blood type AB?

- A. A, B, or AB
- B. O or B, only
- C. AB, O, or A
- D. O or A, only

114. In rats, black coat color is dominant over white coat color. If some of the offspring of a cross between a black rat and a white rat are white, the black rat must have been

- A. a polyploid
- B. homozygous
- C. heterozygous
- D. a mutation

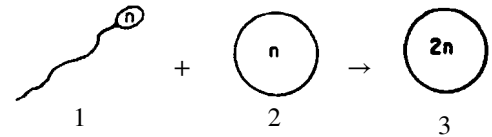
115. The pedigree chart shown represents the inheritance of sickle-cell anemia through three generations. Which symbols could be used to represent individual 9 in generation III?



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

116. In the diagram shown, in which structure would homologous pairs of chromosomes normally be present?

- A. 1, only
- B. 2, only
- C. 3, only
- D. either 1 or 2



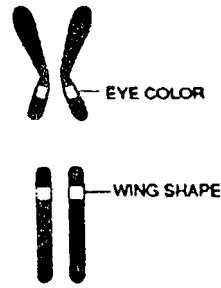
117. Basic principles of heredity established by Mendel include
- A. dominance, gene linkage, and sex linkage
  - B. dominance, independent assortment, and gene linkage
  - C. dominance, independent assortment, and segregation
  - D. independent assortment, gene linkage, and segregation

118. The chart shown indicates a method of representing traits in pea plants. Some offspring of a cross in pea plants were tall and green. According to the chart, these plants could be represented by

- A. TTYY
- B. Ttyy
- C. ttYy
- D. TtYy

Symbol for Gene	Trait Represented
<i>T</i>	tall
<i>t</i>	short
<i>Y</i>	yellow
<i>y</i>	green

119. The diagrams shown represent two pairs of homologous chromosomes present in the diploid cells of a fruit fly. The locations of the alleles for eye color and wing shape are indicated. According to this information, eye color is



- A. dominant over wing shape
- B. linked to wing shape
- C. recessive to wing shape
- D. independent of wing shape

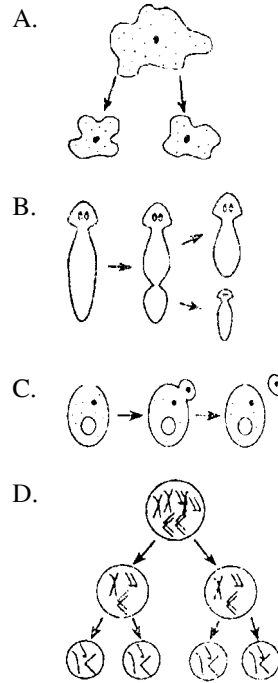
120. Corn seeds of the same species were separated into two groups. One group was grown in the dark and the other group was grown in the light. All other environmental conditions remained constant. After a week, the seeds germinated in the dark produced no green-leaved plants and 97 white-leaved plants, while seeds germinated in the light produced 74 green-leaved plants and 23 white-leaved plants. The plants originally grown in the dark were then placed in the light. After 2 days, 73 white-leaved plants turned green and 24 stayed white. From these observations, it may be concluded that

- A. neither heredity nor environment is important in determining the phenotype of corn plants
- B. both heredity and environment are important in determining the phenotype of corn plants
- C. environment is the only factor that determines the phenotype of corn plants
- D. heredity is the only factor that determines the phenotype of corn plants

121. Two mice that are heterozygous for black coat color are mated. Assuming coat color in mice is controlled by a single pair of genes, which genotypic ratio for coat color is expected in the offspring?

- A. 1:2:1
- B. 9:7
- C. 3:1
- D. 1:3:1

122. Which illustration represents a process that results in the production of gametes?



123. The genetic concepts of segregation and recombination are best illustrated when

- A. corn seeds are exposed to mutagenic agents
- B. plants that are heterozygous for a trait are crossed
- C. plant genotypes are influenced by environmental factors
- D. geraniums are produced by vegetative propagation



124. When a brown mink and silver-blue mink were crossed, all of the offspring produced were brown. When these offspring were mated, they produced 60 brown minks and 20 silver-blue minks. Of the 60 brown minks, the number that are heterozygous should be closest to

- A. 10      B. 20      C. 40      D. 60

125. Each body cell of a chimpanzee contains 48 chromosomes. How many chromosomes would normally be present in a gamete produced by this chimpanzee?

- A. 24      B. 36      C. 48      D. 96

126. Some basic principles of heredity were established when Gregor Mendel crossed large numbers of pea plants and then

- A. mapped the loci of various genes  
B. analyzed the mathematical ratios of certain traits in the offspring  
C. microdissected the chromosomes of the offspring  
D. determined how many genes had mutated

127. In chickens, rose comb (R) is dominant over single comb (r). When a heterozygous rose-combed rooster is mated with several single-combed hens, what is the expected phenotypic ratio of the offspring?

- A. 100% rose-combed  
B. 100% single-combed  
C. 75% rose-combed and 25% single-combed  
D. 50% rose-combed and 50% single-combed

128. In certain plants, each cell contains double the normal chromosome number. These  $4n$  cells are an example of the condition known as

- A. replication                      B. diploidy  
C. polyploidy                      D. disjunction

129. Which is a true statement about people with the genotype  $I^A I^B$  for blood type?

- A. They have two alleles that are codominant.  
B. They exhibit a type O phenotype.  
C. They are homozygous for blood type A.  
D. They can have only type O children.

130. Genes for two different traits that are located next to each other on the same chromosome would most likely be

- A. inherited separately
- B. codominant
- C. recombined
- D. inherited together

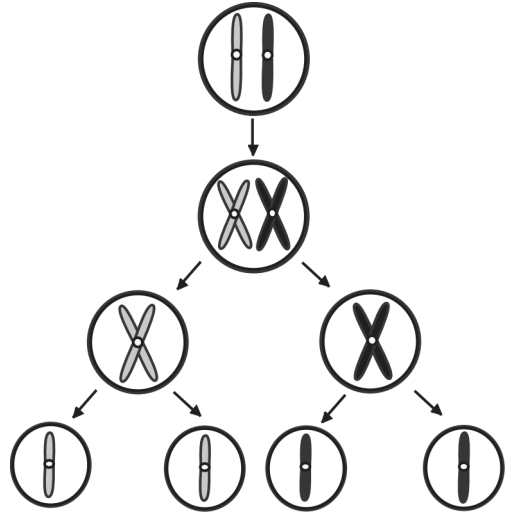
131. Gregor Mendel formulated some basic principles of heredity from the results of his experiments with

- A. *Drosophila*
- B. bacteria
- C. four-o'clock plants
- D. pea plants

132. A human male will normally transmit the genes on his X-chromosome to

- A. his sons, only
- B. his daughters, only
- C. all of his sons and daughters
- D. half of his sons and half of his daughters

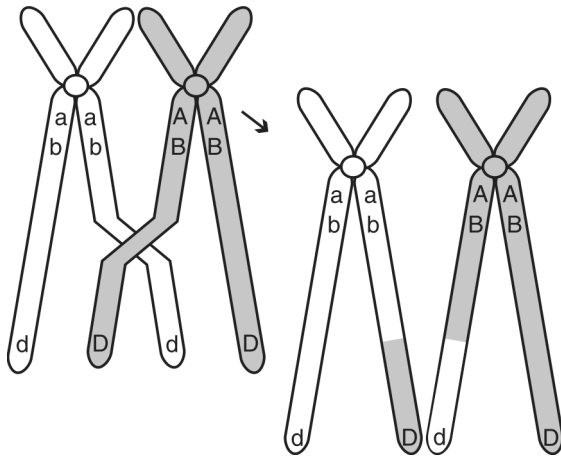
133. The diagram below shows a cellular process that occurs in organisms.



This process is known as

- A. meiosis.
- B. mitosis.
- C. endocytosis.
- D. phagocytosis.

134.



The diagram above shows homologous chromosomes during prophase I of meiosis. Which of the following correctly describes the process being illustrated?

- A. mutation in which the DNA content of the gene is altered
- B. segregation of sister chromatids
- C. condensation and segregation of alleles
- D. crossing-over in which alleles are exchanged

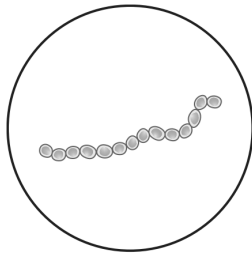
135. A scientist conducted a study of an organism and found that its body cells contained 40 chromosomes. These cells were cultured in the laboratory, and cell division was observed. What difference, if any, would the scientist expect to observe between body cell division and sex cell division in the organism?

- A. Body cells divide by mitosis, and sex cells divide by meiosis.
- B. Body cells divide by meiosis, and sex cells divide by mitosis.
- C. There is no difference; body cells and sex cells both divide by mitosis.
- D. There is no difference; body cells and sex cells both divide by meiosis.

136. During cell replication, an error may result in a base pair substitution. Which of these terms describes the change in the base pair sequence?

- A. cloning
- B. meiosis
- C. mutation
- D. translation

137. Use the diagram of the two different organisms and the information below to answer the following question(s).



*Streptococcus* (1000×)



Frog

*Streptococcus* is a type of bacteria that causes strep throat in humans. A frog is a multicellular organism that lives in aquatic environments.

Which of these is the type of reproduction used by *Streptococcus*?

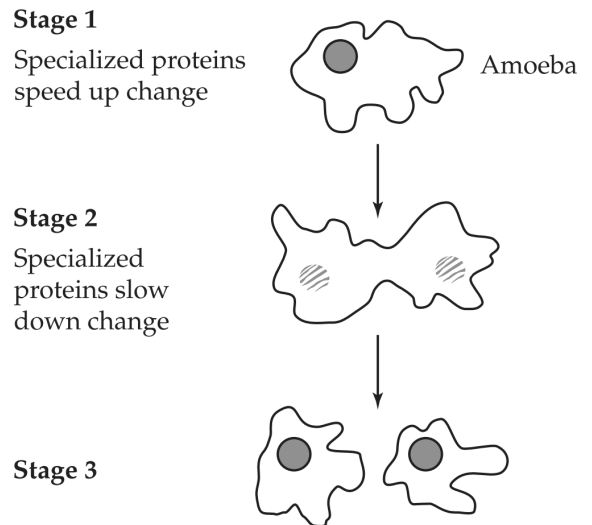
- A. binary fission                      B. meiosis  
C. crossing-over                        D. budding
138. A protein called p53 can keep cells from dividing. To prevent cell division, this protein *most likely* stops

- A. osmosis                                B. mitosis  
C. respiration                            D. mutation

139. Use the information and the diagram below to answer the following question(s).

The diagram below shows stages of cell division of an amoeba, a unicellular organism.

#### CELL DIVISION IN AN AMOEBIA



Scientists have found that the rate of division in amoebas is controlled. Scientists believe that the transition from stage 2 to stage 3 is slowed by proteins. The additional time seems to help the amoeba change coding errors caused during DNA replication.

How does the chromosome number of the amoeba in stage 1 compare to an amoeba in stage 3?

- A. half the number of chromosomes  
B. the same number of chromosomes  
C. twice the number of chromosomes  
D. four times the number of chromosomes

140. During sexual reproduction, a sperm cell fertilizes an egg cell to form a fertilized egg. The fertilized egg then develops into a new organism.

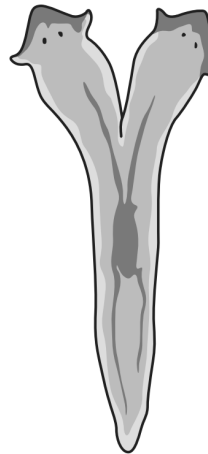
Which statement describes the primary advantage of sexual reproduction over asexual reproduction?

- A. Sexual reproduction produces identical offspring.
- B. Sexual reproduction results in less adaptable offspring.
- C. Sexual reproduction generates a large number of offspring.
- D. Sexual reproduction results in genetic variation in offspring.

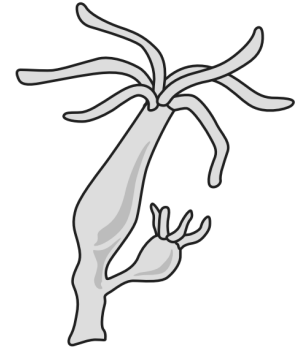
141. During which process does genetic material come from two parents?

- A. asexual reproduction
- B. photosynthesis
- C. respiration
- D. sexual reproduction

142. The diagrams below show a planarian reproducing by splitting in two and a hydra reproducing by budding.



Planarian

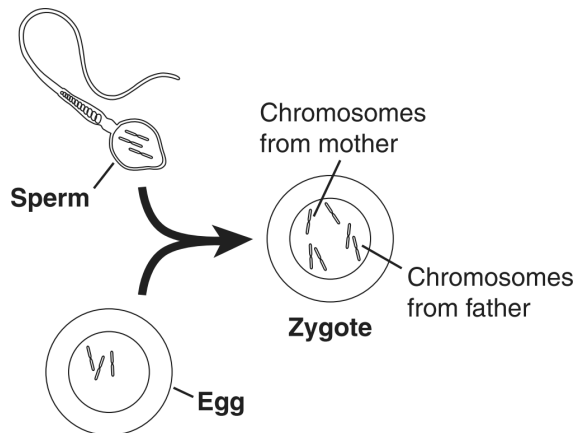


Hydra

Which of the following do the new planarian and hydra have in common with the original planarian and hydra?

- A. The fertilization occurs externally.
- B. The egg and sperm are united.
- C. The offspring of each organism has similar but slightly different genes.
- D. The offspring of each organism is identical to its parent.

143. The diagram below shows the formation of a zygote from an egg and a sperm. Chromosomes carry genetic information.



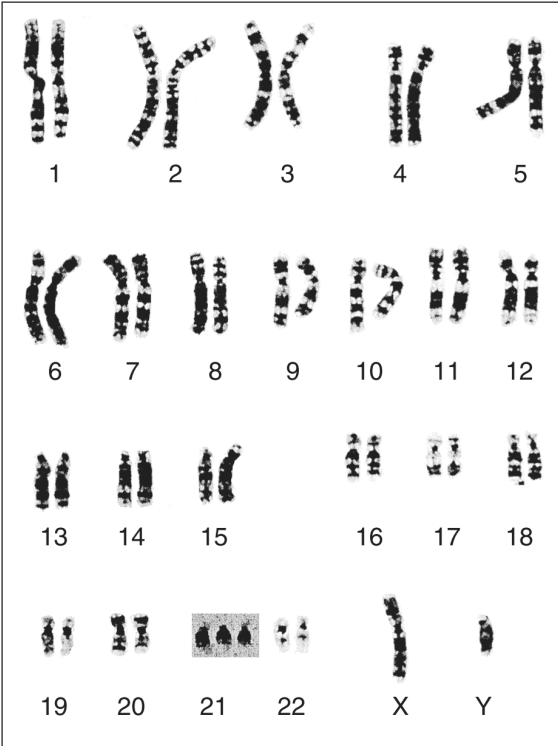
Which reproduction concept does the diagram show?

- A. All the genetic information in a zygote is from one parent.
  - B. All the genetic information in sperm is from both parents.
  - C. Fertilization ensures that traits are inherited from both parents.
  - D. Fertilization results in a reduced number of chromosomes.
144. Which statement *best* describes the importance of sexual reproduction?
- A. Sexual reproduction produces offspring that are identical.
  - B. Sexual reproduction produces variation among offspring.
  - C. Sexual reproduction provides for the regeneration of body parts in some species.
  - D. Sexual reproduction occurs between individuals of the same species.

145. Which statement describes how sex cells are different from other body cells?

- A. Sex cells have twice the genetic information of other body cells.
- B. Sex cells have only half the genetic information of other body cells.
- C. Sex cells are made by the union of cells, and other body cells are made by cell division.
- D. Sex cells are used for growth, and other body cells are used for repair.

146. The picture below shows the chromosomes of a human.



What caused the chromosomal alteration in number 21?

- A. part of one chromosome attached to another chromosome (translocation)
- B. some of the genes on a chromosome were reversed (inversion)
- C. a duplicated chromosome failed to separate (nondisjunction)
- D. a part of a chromosome was lost (deletion)

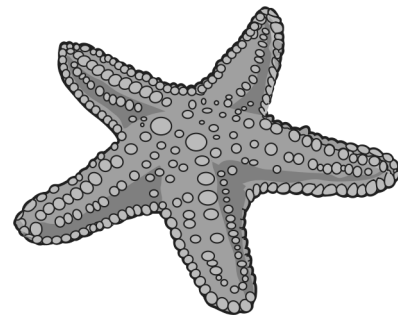
147. The following table describes one method each organism can use to reproduce.

Methods of Reproduction	
Organism	Description
Jellyfish	A part of the parent breaks off and becomes a new jellyfish.
Komodo dragon	A female produces eggs that develop into young without a male.
Swordtail fish	A female lays eggs that were fertilized by a male.
Bacterium	The single-celled organism splits into two cells that are identical.

Which organism reproduces sexually?

- A. Jellyfish
- B. Komodo dragon
- C. Swordtail fish
- D. Bacterium

148. The following picture shows a sea star.



Two new sea stars can be produced by dividing one sea star in half.

Which type of reproduction is described above?

- A. Sexual
- B. Cloning
- C. Asexual
- D. External

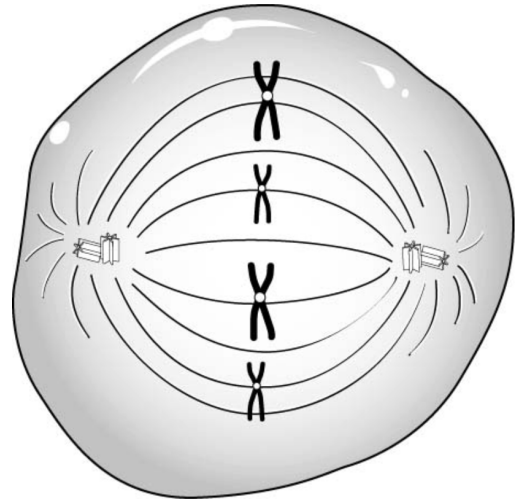
149. The spider plant reproduces asexually. The runners, which are similar to roots, grow from the parent plant. Other plants grow from these runners. Which of the following statements is true about a plant that is asexual?

- A. The DNA of the new plant is a new unique strand of DNA.
- B. The DNA of the new plant is a blend of the parent plant's DNA.
- C. The DNA of the new plant is the same as the DNA of the parent plant.
- D. The DNA of the new plant is different from the DNA of the parent plant.

150. A species with 12 chromosomes in each somatic cell will produce sex cells with—

- A. 3 chromosomes.
- B. 4 chromosomes.
- C. 6 chromosomes.
- D. 24 chromosomes.

151.



What phase of mitosis is represented by the diagram shown above?

- A. Metaphase
- B. Prophase
- C. Telophase
- D. Interphase

152. A colony of red bacteria is allowed to reproduce for 16 generations. A scientist examines the colony at the end of the time and notes that all the individuals are almost identical in all characteristics. This evidence suggest that the bacteria

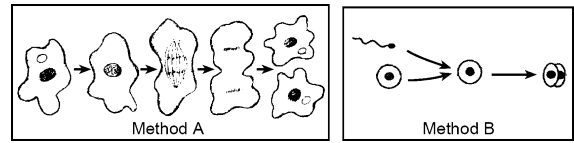
- A. did not receive the proper nutrients
- B. reproduce sexually
- C. exchange genetic material
- D. reproduced asexually



153. One way to produce large numbers of genetically identical offspring is by
- A. cloning
  - B. fertilization
  - C. changing genes by agents such as radiation or chemicals
  - D. inserting a DNA segment into a different DNA molecule

154. Which characteristic of sexual reproduction has specifically favored the survival of animals that live on land?
- A. fusion of gametes in the outside environment
  - B. male gametes that may be carried by the wind
  - C. fertilization within the body of the female
  - D. female gametes that develop within ovaries

155. How does the type of reproduction shown in method A in the accompanying diagram differ from the type of reproduction shown in method B?

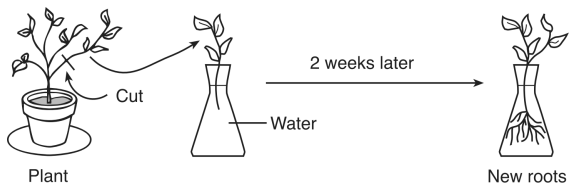


- A. Method A illustrates sexual reproduction, and method B illustrates asexual reproduction.
  - B. Offspring produced by method B will be genetically alike, but offspring produced by method A will be genetically different.
  - C. The two cells shown in the last step of method A are genetically alike, but the two cells shown in the last step of method B are genetically different.
  - D. Offspring produced by method A will be genetically like the parent, but offspring produced by method B will be genetically different from the parents.
156. A variation causes the production of an improved variety of apple. What is the best method to use to obtain additional apple trees of this variety in the shortest period of time?
- A. selective breeding
  - B. natural selection
  - C. asexual reproduction
  - D. hormone therapy

157. When a planarian (a type of worm) is cut in half, each half usually grows back into a complete worm over time. This situation most closely resembles

- A. asexual reproduction in which a mutation has occurred
- B. sexual reproduction in which each half represents one parent
- C. asexual reproduction of a single-celled organism
- D. sexual reproduction of a single-celled organism

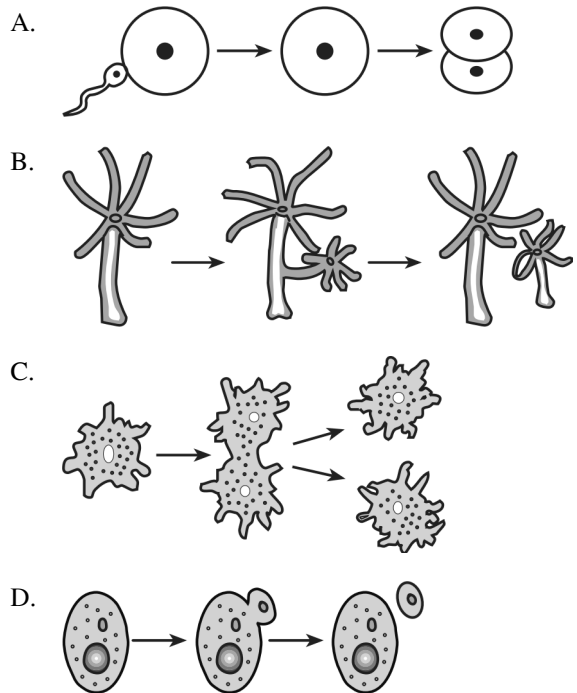
158. A technique used to reproduce plants is shown in the diagram below.



This technique is a form of

- A. sexual reproduction
- B. asexual reproduction
- C. gamete production
- D. gene manipulation

159. Which process usually results in offspring that exhibit new genetic variations?



160. Sexual reproduction in a species usually results in

- A. an increase in the chromosome number in the offspring
- B. offspring genetically identical to the parent
- C. recombination of genes
- D. a decrease in biodiversity

161. A significant difference between the effects of the genetic information passed on from asexually reproducing parents to their offspring and sexually reproducing parents to their offspring is the

- A. degree of modification of the size of chromosomes
- B. types of DNA subunits
- C. number of chromosomes in the body cells of the offspring
- D. amount of variation between the parents and the offspring

162. Scientists have been investigating a way to recreate extinct species such as the saber-toothed cat illustrated below.



Source: <https://IGS.Indiana.edu>

Which technique would use DNA from an extinct species to recreate an organism of the species?

- A. natural selection
- B. differentiation
- C. cloning
- D. selective breeding

Biology Standard 3 (All elements)      4/24/2023

1.		15.	
Answer:	D	Answer:	D
Points:	1	Points:	1
2.		16.	
Answer:	D	Answer:	B
Points:	1	Points:	1
3.		17.	
Answer:	B	Answer:	A
Points:	1	Points:	1
4.		18.	
Answer:	C	Answer:	B
Points:	1	Points:	1
5.		19.	
Answer:	A	Answer:	B
Points:	1	Points:	1
6.		20.	
Answer:	A	Answer:	C
Points:	1	Points:	1
7.		21.	
Answer:	A	Answer:	A
Points:	1	Points:	1
8.		22.	
Answer:	C	Answer:	A
Points:	1	Points:	1
9.		23.	
Answer:	A	Answer:	D
Points:	1	Points:	1
10.		24.	
Answer:	D	Answer:	A
Points:	1	Points:	1
11.		25.	
Answer:	C	Answer:	A
Points:	1	Points:	1
12.		26.	
Answer:	C	Answer:	D
Points:	1	Points:	1
13.		27.	
Answer:	D	Answer:	D
Points:	1	Points:	1
14.		28.	
Answer:	B	Answer:	C
Points:	1	Points:	1
		29.	
		Answer:	A
		Points:	1

30.  
Answer: B  
Points: 1

31.  
Answer: D  
Points: 1

32.  
Answer: D  
Points: 1

33.  
Answer: B  
Points: 1

34.  
Answer: A  
Points: 1

35.  
Answer: A  
Points: 1

36.  
Answer: D  
Points: 1

37.  
Answer: A  
Points: 1

38.  
Answer: B  
Points: 1

39.  
Answer: C  
Points: 1

40.  
Answer: B  
Points: 1

41.  
Answer: C  
Points: 1

42.  
Answer: C  
Points: 1

43.  
Answer: D  
Points: 1

44.  
Answer: B  
Points: 1

45.  
Answer: A  
Points: 1

46.  
Answer: D  
Points: 1

47.  
Answer: C  
Points: 1

48.  
Answer: B  
Points: 1

49.  
Answer: D  
Points: 1

50.  
Answer: C  
Points: 1

51.  
Answer: B  
Points: 1

52.  
Answer: C  
Points: 1

53.  
Answer: D  
Points: 1

54.  
Answer: B  
Points: 1

55.  
Answer: D  
Points: 1

56.  
Answer: B  
Points: 1

57.  
Answer: B  
Points: 1

58.  
Answer: D  
Points: 1

59.  
Answer: A  
Points: 1

60.  
Answer: C  
Points: 1

61.  
Answer: B  
Points: 1

62.  
Answer: B  
Points: 1

63.  
Answer: A  
Points: 1

64.  
Answer: D  
Points: 1

65.  
Answer: B  
Points: 1

66.  
Answer: C  
Points: 1

67.  
Answer: A  
Points: 1

68.  
Answer: D  
Points: 1

69.  
Answer: A  
Points: 1

70.  
Answer: B  
Points: 1

71.  
Answer: B  
Points: 1

72.  
Answer: C  
Points: 1

73.  
Answer: C  
Points: 1

74.  
Answer: A  
Points: 1

75.  
Answer: D  
Points: 1

76.  
Answer: A  
Points: 1

77.  
Answer: D  
Points: 1

78.  
Answer: C  
Points: 1

79.  
Answer: C  
Points: 1

80.  
Answer: A  
Points: 1

81.  
Answer: D  
Points: 1

82.  
Answer: B  
Points: 1

83.  
Answer: A  
Points: 1

84.  
Answer: D  
Points: 1

85.  
Answer: A  
Points: 1

86.  
Answer: D  
Points: 1

87.  
Answer: C  
Points: 1

88.  
Answer: B  
Points: 1

89.  
Answer: A  
Points: 1

90.  
Answer: C  
Points: 1

91.  
Answer: A  
Points: 1

92.  
Answer: D  
Points: 1

93.  
Answer: D  
Points: 1

94.  
Answer: A  
Points: 1

95.  
Answer: B  
Points: 1

96.  
Answer: B  
Points: 1

97.  
Answer: A  
Points: 1

98.  
Answer: B  
Points: 1

99.  
Answer: B  
Points: 1

100.  
Answer: A  
Points: 1

101.  
Answer: C  
Points: 1

102.  
Answer: A  
Points: 1

103.  
Answer: A  
Points: 1

104.  
Answer: A  
Points: 1

105.  
Answer: B  
Points: 1

106.  
Answer: C  
Points: 1

107.  
Answer: C  
Points: 1

108.  
Answer: B  
Points: 1

109.  
Answer: B  
Points: 1

110.  
Answer: C  
Points: 1

111.  
Answer: D  
Points: 1

112.  
Answer: B  
Points: 1

113.  
Answer: A  
Points: 1

114.  
Answer: C  
Points: 1

115.  
Answer: B  
Points: 1

116.  
Answer: C  
Points: 1

117.  
Answer: C  
Points: 1

118.  
Answer: B  
Points: 1

119.  
Answer: D  
Points: 1

120.  
Answer: B  
Points: 1

121.  
Answer: A  
Points: 1

122.  
Answer: D  
Points: 1

123.  
Answer: B  
Points: 1

124.  
Answer: C  
Points: 1

125.  
Answer: A  
Points: 1

126.		140.	
Answer:	B	Answer:	D
Points:	1	Objective:	3.C.1.e
		Points:	1
127.		141.	
Answer:	D	Answer:	D
Points:	1	Points:	1
128.		142.	
Answer:	C	Answer:	D
Points:	1	Points:	1
129.		143.	
Answer:	A	Answer:	C
Points:	1	Points:	1
130.		144.	
Answer:	D	Answer:	B
Points:	1	Points:	1
131.		145.	
Answer:	D	Answer:	B
Points:	1	Points:	1
132.		146.	
Answer:	B	Answer:	C
Points:	1	Points:	1
133.		147.	
Answer:	A	Answer:	C
Points:	1	Objective:	MS 3d1
134.		Points:	1
Answer:	D	148.	
Points:	1	Answer:	C
135.		Objective:	MS 3d1
Answer:	A	Points:	1
Objective:	D.36	149.	
Points:	1	Answer:	C
136.		Objective:	MS 62a
Answer:	C	Points:	1
Objective:	3.3.4	150.	
Points:	1	Answer:	C
137.		Objective:	MS B03g
Answer:	A	Points:	1
Objective:	3.2.1	151.	
Points:	1	Answer:	A
138.		Objective:	MS B03f
Answer:		Points:	1
Objective:	3.2.1	152.	
Points:	1	Answer:	D
139.		Points:	1
Answer:	B	153.	
Objective:	3.2.1	Answer:	A
Points:	1	Points:	1
		154.	
		Answer:	C
		Points:	1



155.  
Answer: D  
Points: 1

156.  
Answer: C  
Points: 1

157.  
Answer: C  
Points: 1

158.  
Answer: B  
Points: 1

159.  
Answer: A  
Points: 1

160.  
Answer: C  
Points: 1

161.  
Answer: D  
Points: 1

162.  
Answer: C  
Points: 1