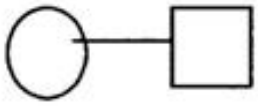
Student: _____

1. A _____ is a sequence of nucleotides that codes a basic unit of biological information.
   _____
2. _____ is the science of heredity, and it seeks a precise explanation of the biological structures and mechanisms that determine what is inherited and how it is inherited.
   _____
3. _____ is the purposeful control over mating by choice of parents for the next generation.
   _____
4. _____ is the process whereby both egg and pollen come from the same plant.
   _____
5. The _____ ___ _____ is a Mendelian law that states that both alleles must separate during gamete formation.
   _____
6. _____, _____ and _____ all were involved in the rediscovery of Mendel's research.
   _____
7. _____-_____ lines produce offspring carrying specific parental traits that remain constant from generation to generation.
   _____
8. The _____ _____ or F_2 generation is the progeny of the first filial or F_1 generation.
   _____
9. Describe the meaning of each symbol.
   _____

10. _____

11. _____



12. _____

13. Inherited trait expressed only when the controlling gene is homozygous.

14. The alternative forms of a single gene.

15. A cross in which the traits carried by the male parent and the female parent are reversed.

16. The first offspring from the parents are called
    A. P.
    B. $F_{1.}$
    C. $F_{2.}$
    D. testcross.
    E. backcross.

17. Which of the following terms is not a type of mating cross?
    A. reciprocal
    B. testcross
    C. monohybrid
    D. dihybrid
    E. dominant

18. A _____ is a cross between an unknown and a homozygous recessive.
    A. testcross
    B. dihybrid
    C. monohybrid
    D. backcross
    E. controlled

19. If an individual has 10 gene pairs, how many different gametes can be formed if three of the gene pairs are homozygous and the remaining seven gene pairs are heterozygous?
    A. 49
    B. 100
    C. 128
    D. 1024
    E. 131,072

20. If the parents of a family already have two boys, what is the probability that the next two offspring will be girls?
    A. 1
    B. 1/2
    C. 1/3
    D. 1/4
    E. 1/8

21. In some genetically engineered corn plants the dominant gene (BT) produces a protein that is lethal to certain flying insect pests that eat the corn plants. It was also found that the pollen could cause death in some flying insects. If the corn plant is heterozygous for BT, what proportion of the pollen would carry the dominant gene?
    A. all pollen
    B. 1/2
    C. 1/3
    D. 1/4
    E. 1/8

22. Suppose that in plants, smooth seeds (S) are dominant to wrinkled seeds (s) and tall plants (T) are dominant to short plants (t). A tall plant with smooth seeds was backcrossed to a parent that was short and wrinkled. What proportion of the progeny is expected to be heterozygous for tall and smooth?
    A. 1/2
    B. 1/4
    C. 1/8
    D. 1/16
    E. 0

23. Suppose that in plants, smooth seeds (S) are dominant to wrinkled seeds (s) and tall plants (T) are dominant to short plants (t). A tall plant with smooth seeds was backcrossed to a parent that was short and wrinkled. What proportion of the progeny is expected to be homozygous for short and wrinkled?
    A. 1/2
    B. 1/4
    C. 1/8
    D. 1/16
    E. 0

24. A rare recessive trait in a pedigree is indicated by which pattern of inheritance?
    A. vertical
    B. horizontal
    C. diagonal
    D. both vertical and horizontal
    E. None of these is correct.

25. Sickle cell anemia is a recessive trait in humans. In a cross between a father who has sickle cell anemia and a mother who is heterozygous for the gene, what is the probability that their first three children will have the normal phenotype?
    A. 1/4
    B. 1/2
    C. none
    D. 1/8
    E. 1/16 will be albino

26. The dominant trait, Huntington disease causes severe neural/brain damage at approximately age 40. A female whose mother has Huntington disease marries a male whose parents are normal. It is not known if the female has the disease. What is the probability that their firstborn will inherit the gene that causes Huntington disease?
    A. 25%
    B. 50%
    C. 75%
    D. 100%
    E. 0%

27. In a monohybrid cross AA × aa, what proportion of homozygotes is expected among the F_2 offspring?

    A. 1/4
    B. 1/2
    C. 3/4
    D. All are homozygotes.
    E. None are homozygotes.

28. In a monohybrid cross AA × aa, what proportion of heterozygotes is expected among the F_2 offspring?

    A. 1/4
    B. 1/2
    C. 3/4
    D. All are heterozygotes.
    E. None are heterozygotes.

29. In a dihybrid cross AAbb × aaBB, what proportion of homozygotes is expected among the F_2 offspring?

    A. 1/4
    B. 1/2
    C. 3/4
    D. All are homozygotes.
    E. None are homozygotes.

30. In a dihybrid cross AABB × aabb, what proportion of heterozygotes for both gene pairs is expected among the F_2 offspring?
    A. 1/4
    B. 1/2
    C. 3/4
    D. All are heterozygotes.
    E. None are heterozygotes.

31. In the dihybrid cross AaBb × aabb, what proportion of homozygotes is expected among the F_1 offspring?

    A. 1/4
    B. 1/2
    C. 3/4
    D. All are homozygotes.
    E. None are homozygotes.

32. In the dihybrid cross AaBb × aabb, what proportion of heterozygotes for both gene pairs is expected among the F_1 offspring?
    A. 1/4
    B. 1/2
    C. 3/4
    D. All are heterozygotes.
    E. None are heterozygotes.

33. Among the dihybrid crosses below, which will produce a 1:1 phenotypic ratio?
    A. AABB × aabb
    B. AaBb × AaBb
    C. AaBb × aabb
    D. AaBB × aaBB
    E. AAbb × aaBB

34. Among the dihybrid crosses below, which will give a 1:1:1:1 ratio?
    A. AABB × aabb
    B. AaBb × AaBb
    C. AaBb × aabb
    D. AaBB × aaBB
    E. AAbb × aaBB

35. Assume that in guinea pigs, dark brown fur (B) is dominant to black fur (b). If you mate a homozygous black guinea pig with a heterozygous brown guinea pig, what proportion of the progeny will be black?

    A. none
    B. 1/4
    C. 1/2
    D. 3/4
    E. all

36. Assume that in guinea pigs, dark brown fur (B) is dominant to black fur (b). If you mate a homozygous black guinea pig with a homozygous brown guinea pig, what proportion of the progeny will be heterozygous?
    A. none
    B. 1/4
    C. 1/2
    D. 3/4
    E. all

37. Assume that in guinea pigs, dark brown fur (B) is dominant to black fur (b). If you mate a black guinea pig with a homozygous brown guinea pig, what proportion of the progeny will be homozygous?
    A. none
    B. 1/4
    C. 1/2
    D. 3/4
    E. all

    Match the following terms with the best definition
    a. self-fertilization
    b. cross fertilize
    c. monohybrid crosses
    d. artificial selection
    e. reciprocal crosses

38. _____ The purposeful control of mating by choice of parents for the next generation.
    _____

39. _____ Fertilization in which both egg and pollen come from the same plant, resulting in offspring with the same genetic traits as the single parent.
_____

40. _____ To brush the pollen from one plant onto the female organ of another plant, thereby creating offspring with the particular traits of the selected parent plants.
_____

41. _____ Crosses in which the male and female traits are reversed, thereby controlling whether a particular trait is transmitted by the egg or the pollen.
_____

42. _____ is/are a cross(es) between parents that differ in only one trait.
A. Self-fertilization
B. Cross fertilize
C. Monohybrid crosses
D. Artificial selection
E. Reciprocal crosses

43. An allele that expresses its phenotype even when heterozygous with a recessive allele is termed
A. recessive.
B. recombinant.
C. dominant.
D. parental.
E. independent.

44. An alternative form of a single gene is known as
A. parental.
B. dihybrid.
C. reciprocal.
D. allele.
E. recessive.

45. The diploid cell formed by the fertilization of the egg by the sperm during sexual reproduction is a
A. reciprocal.
B. zygote.
C. dihybrid.
D. gamete.
E. monohybrid.

46. A phenotype reflecting a new combination of genes occurring during gamete formation is called
A. a recombinant type.
B. an independent assortment.
C. heterozygous.
D. homozygous.
E. a multihybrid cross.

47. The actual alleles present in an individual make up the individual's
A. recombinant types.
B. zygote.
C. dominant allele.
D. allele.
E. genotype.

48. Mendel was the only botanist to work with large numbers of offspring, to count all offspring, subject his results to statistical analysis, and then compare his results with predictions based on his models.
True False

49. The mating of parents with antagonistic traits produces hybrids.
True False

50. Mendel's law of segregation states that two alleles for each trait unite in a specific manner during gamete formation and therefore give rise to predictable observable traits.
True False

51. Dihybrid crosses helped reveal the Law of Independent Assortment.
True False

52. The Punnett square was introduced in 1906 by Reginald Punnett and provides a simple and convenient method of tracking possible combinations of gametes that might be produced in a given cross.
True False

53. Using the product rule, one would calculate the probability of parents having six children who are all boys as $(½)^6$.
True False

54. The sum rule states that the probability of both of two mutually exclusive events occurring is the sum of their individual probabilities.
True False

55. If you know the phenotype and the dominance relation of the alleles you can predict the genotype.
True False

56. An individual can be a heterozygote for one trait and a homozygote for another.
True False

57. A testcross is a cross between two heterozygotes.
True False

58. At fertilization, in the mating of dihybrids, four different kinds of eggs can combine with four different kinds of pollen, producing a total of sixteen different genotypes.
True False

59. During gamete formation, different pairs of alleles on different chromosomes segregate independently of each other.
True False

60. If yellow and round phenotypes in peas are dominant, you know the genotype of all peas that are green and wrinkled.
True False

61. A pedigree is a family history of a specific trait shown for a minimum of three generations.
True False

62. Several single-gene disorders are more common in some populations of people than in others.
True False

63. A lethal disorder does not include the inheritance of traits that cause death in adulthood.
True False

64. The following symbols ~ = $^{\pm}$ indicate a consanguineous mating.
True False

65. Cross-fertilization is the same as reciprocal cross.
True False

66. The first filial generation is the offspring of parents.
True False

67. A zygote is a fertilized egg.
True False

68. A YY or yy genotype is called heterozygous.
True False

69. When Mendel repeated his pea experiments in beans, he found flowers that ranged from white to pale violet to purple. This is due to bean flower color being determined by more than one gene.
True False

70. In corn liguleless, (l^1) is recessive to ligules (L^1) and a green leaf (G) is dominant to the normal non-green (g). If a plant homozygous for liguleless and green leaves is crossed to one homozygous for non-green with ligules, predict the phenotypes and genotypes of the F_1.

71. In corn liguleless, (l^1) is recessive to ligules (L^1) and a green leaf (G) is dominant to the normal non-green (g). If a testcross is performed with a plant heterozygous for ligules and green leaves, what would be the phenotypes and genotypes of the progeny?

72. In corn liguleless, (l^1) is recessive to ligules (L^1) and a green leaf (G) is dominant to the normal non-green (g). If a plant homozygous for liguleless and green leaves is crossed to one homozygous for non-green with ligules predict the phenotypes and genotypes of the F_2.

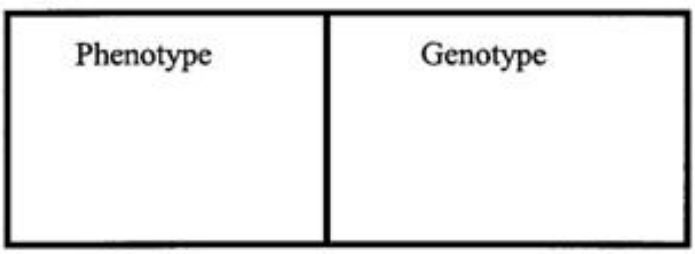
73. In *Drosophila,* forked bristles (fk) are recessive to normal (fk+) and glassy eyes (gls) are recessive to normal (gls+). If a homozygous wild-type male is mated to a forked-bristle, glassy-eye female, predict the genotypes and phenotypes of the F_1.

74. In *Drosophila*, forked (fk) bristles are recessive to normal (fk+) and glassy eyes (gls) are recessive to normal (gls+). If an F_1 heterozygous female is backcrossed to the homozygous wild-type male parent, predict the genotypes and phenotypes of the offspring.

75. In *Drosophila*, forked (fk) bristles are recessive to normal (fk+) and glassy eyes (gls) are recessive to normal (gls+). If a homozygous wild-type male is mated to a forked-bristled, glassy-eyed female, predict the genotypes and phenotypes of the F_2.

76. A rosy-eyed *Drosophila* with wild-type bristles was crossed with a forked *Drosophila* with wild-type eyes. The F_1 were wild type for both traits, whereas the F_2 consisted of 306 wild-type, 94 rosy-eyed, 102 fork-bristled, and 33 forked-bristled and rosy-eyed flies. Infer the genotypes of the parents.

77. In pecans, the outer shell may be thick (T) or thin (t). The shell of pecans is the pericarp. If you use the pollen from a homozygous thick shell to pollinate a thin-shell tree, what shell type would form on the pecans of this tree following the cross?



78. If you use the seed from the pecans of the above cross to produce an F_2, what shell type will form on the pecans of the F_1 plant?

Phenotype	Genotype

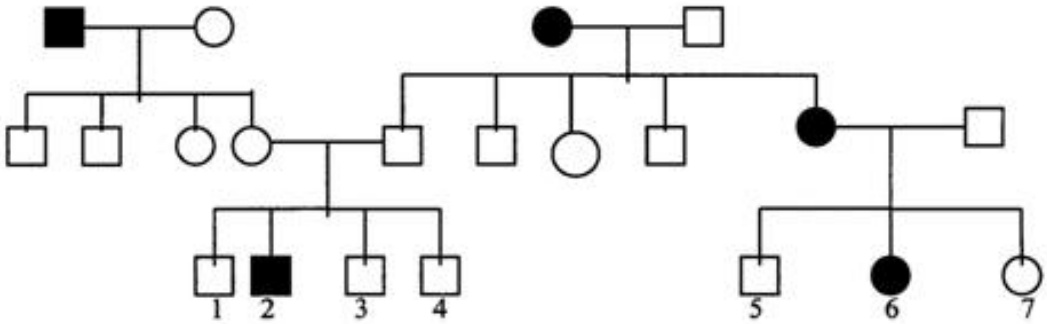
79. After a cross between two corn plants, the F_1 plants all had a dwarfed phenotype. The F_2 consisted of 1,207 dwarf plants and 401 tall plants. Identify the phenotypes and genotypes of the two parents.

Parent A	Parent B
Genotype _____	Genotype _____
Phenotype _____	Phenotype _____

80. After a cross between two mice, the F_1 offspring all had the same phenotype. The F_2 consisted of 91 short tails and 29 normal tails. Identify the phenotypes and genotypes of the two parent mice.

Parent A	Parent B
Genotype _____	Genotype _____
Phenotype _____	Phenotype _____

Below is a pedigree for a human trait. Shaded symbols are for individuals exhibiting the trait. (A) Identify the mode of inheritance of the trait. (B) Apply the laws of probability to calculate the probability that the offspring of a marriage between unaffected cousins will exhibit the trait.



81. (A) Mode of inheritance

82. (B) Probability

83. In some plants, a purple pigment is synthesized from a colorless precursor. In a cross between two plants, one purple and the other colorless, an F_1 generation was produced that was all-purple. The F_2 produced from the F_1 had 775 purple, 200 red and 65 colorless. What is the genotype of the parents?

Purple parent	Colorless parent

84. Short hair in rabbits is produced by a dominant gene (l^+) and long hair by its recessive allele (l). Black hair results from the action of a dominant gene (b^+) and brown hair from its allele (b). Determine the genotypic and the corresponding phenotypic ratios of the F_1 from a cross of a female rabbit with brown hair and a male rabbit with long hair. Assume that the female is homozygous for short hair and the male is homozygous for black hair.

85. Short hair in rabbits is produced by a dominant gene (l^+) and long hair by its recessive allele (l). Black hair results from the action of a dominant gene (b^+) and brown hair from its allele (b). Determine the genotypic and the corresponding phenotypic ratios of the F_2 offspring, beginning with a parental cross of a female rabbit with brown hair and a male rabbit with long hair. Assume that the P female is homozygous for short hair and the P male is homozygous for black hair.

86. Stem color of tomato plants is known to be under the genetic control of at least one pair of alleles such that A- results in the production of anthocyanin pigment (purple stem). The recessive genotype aa lacks this pigment and hence is green. The production of two locules (seed chambers) in the tomato fruit is controlled by the dominant allele M, and multiple locules is determined by mm. Determine the genotypic and phenotypic ratios of the F_1 from a cross between an inbred tomato plant with a purple stem and fruit with two locules crossed to a tomato plant with a green stem and fruit with multiple locules.

87. Stem color of tomato plants is known to be under the genetic control of at least one pair of alleles such that A- results in the production of anthocyanin pigment (purple stem). The recessive genotype aa lacks this pigment and hence is green. The production of two locules (seed chambers) in the tomato fruit is controlled by the dominant allele M, and multiple locules is determined by mm. Determine the genotypic and phenotypic ratios of the F_2 offspring beginning with a parental cross between an inbred tomato plant that has a purple stem and fruit with two locules and a tomato plant that has a green stem and fruit with multiple locules.

88. What does a diamond symbol ◊ in a pedigree indicate?

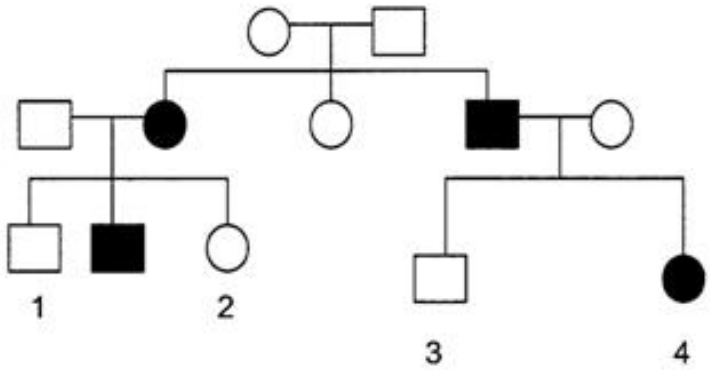
89. What does a vertical pattern of inheritance in a pedigree likely indicate?

90. Calculate the probability of the production of a homozygous recessive genotype for the following cross: AaBbccddEeFf × AaBbCcddEeFf

91. Calculate the probability of either all-dominant or all-recessive genotypes for the alleles A, B, E, and F in the following cross: AaBbccddEeFf × AaBbCcddEeFf

92. What are the four general themes that have arisen from Mendel's work?

What are the possible genotypes of persons 1, 2, 3 and 4?



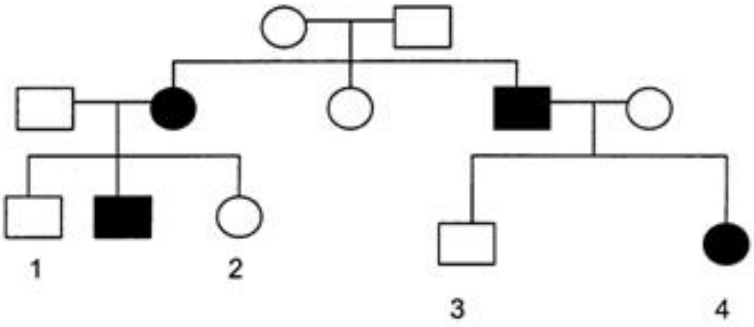
93. Person 1

94. Person 2

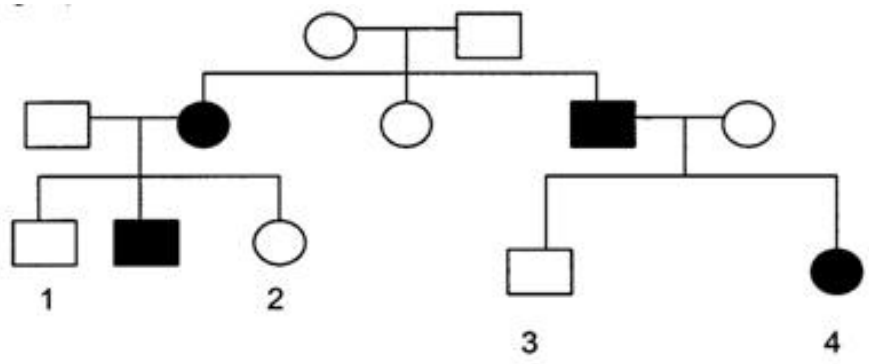
95. Person 3

96. Person 4

97. Below is a pedigree of a human genetic disease in which solid color indicates stricken individuals. Apply the laws of probability and calculate the probability the offspring of the cousin marriage 2 × 3 will exhibit the disease.



98. Below is a pedigree of a human genetic disease in which solid color indicates stricken individuals. Apply the laws of probability and calculate the probability the offspring of the cousin marriage 1 × 4 will exhibit the disease.



99. A youngster has dozens of pet mice and asks you why their coat colors are so different. He explains that his favorite color is black with white patches and wonders how he can get more of them, yet his favorite mice are actually the "nice" white ones who are gentler than the active nippy black ones. You decide to give a simple genetics lesson. Help the youngster set up an artificial selection for "nice" black mice with white spots, including an indication of expected results and an interpretation of the data.

100. As an owner of an orchard you realize that the selective breeding of apple trees to produce the most beautiful red apples have left customers displeased with the now bland-tasting beautiful apples. What has been indicated about the two traits? How would you as an orchard owner fix the problem for the long term?

101. You are out on a nature walk up in the mountains and you find a pretty wildflower in the lower altitude that is short and bushy with small, fragrant, bright purple flowers. In the higher altitude you find what seems to be the same plant, yet it is tall and sparse with larger flowers of the same color and fragrance. A) Set up an experiment to test the hypothesis that the plants are different due to genetic but not environmental influences. B) Is it possible to tell if both genetic and environmental effects occur?

102. You wish to know the genotype of some carrot plants that you have grown in your garden so that you might grow more of them. They have reddish orange flesh, are sweet in taste, long in root, and short in leaf. Using classical genetic techniques how would you determine the genotype?

103. You are talking to your father about your relatives and he shares with you that there is a late-onset disease that seems to run in his family. What could you do to determine your probability of having this late-onset disease?

2 Key

1. A _____ is a sequence of nucleotides that codes a basic unit of biological information.
gene

Blooms Level 1: Remember
Chapter - Chapter 02 #1
Section: 2.01
Topic: General

2. _____ is the science of heredity, and it seeks a precise explanation of the biological structures and mechanisms that determine what is inherited and how it is inherited.
Genetics

Blooms Level 1: Remember
Chapter - Chapter 02 #2
Section: 2.01
Topic: General

3. _____ is the purposeful control over mating by choice of parents for the next generation.
Artificial selection

Blooms Level 1: Remember
Chapter - Chapter 02 #3
Section: 2.01
Topic: General

4. _____ is the process whereby both egg and pollen come from the same plant.

Self fertilization

Blooms Level 1: Remember
Chapter - Chapter 02 #4
Section: 2.01
Topic: Mendelian Inheritance

5. The _____ ___ _____ is a Mendelian law that states that both alleles must separate during gamete formation.
law of segregation

Blooms Level 1: Remember
Chapter - Chapter 02 #5
Section: 2.02
Topic: Mendelian Inheritance

6. _____, _____ and _____ all were involved in the rediscovery of Mendel's research.
Corens, deVries, Tschermak

Blooms Level 1: Remember
Chapter - Chapter 02 #6
Section: 2.02
Topic: Mendelian Inheritance

7. _____-_____ lines produce offspring carrying specific parental traits that remain constant from generation to generation.
Pure-breeding

Blooms Level 1: Remember
Chapter - Chapter 02 #7
Section: 2.01
Topic: Mendelian Inheritance

8. The _____ _____ or F_2 generation is the progeny of the first filial or F_1 generation.
second filial

Blooms Level 1: Remember
Chapter - Chapter 02 #8
Section: 2.02
Topic: Mendelian Inheritance

(p. 31) Describe the meaning of each symbol.

Blooms Level 2: Understand
Chapter - Chapter 02
Section: 2.03
Topic: Mendelian Inheritance

9.

Normal male

Blooms Level 2: Understand
Chapter - Chapter 02 #9
Section: 2.03
Topic: Mendelian Inheritance

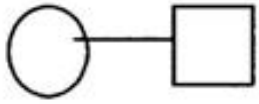
10.

Normal female

Blooms Level 2: Understand
Chapter - Chapter 02 #10
Section: 2.03
Topic: Mendelian Inheritance

11.

Mating



Blooms Level 2: Understand
Chapter - Chapter 02 #11
Section: 2.03
Topic: Mendelian Inheritance

12.

Affected male

Blooms Level 2: Understand
Chapter - Chapter 02 #12
Section: 2.03
Topic: Mendelian Inheritance

13. Inherited trait expressed only when the controlling gene is homozygous.

Recessive

Blooms Level 2: Understand
Chapter - Chapter 02 #13
Section: 2.01
Topic: Mendelian Inheritance

14. The alternative forms of a single gene.

Alleles

Blooms Level 2: Understand
Chapter - Chapter 02 #14
Section: 2.01
Topic: Mendelian Inheritance

15. A cross in which the traits carried by the male parent and the female parent are reversed.

Reciprocal cross

Blooms Level 2: Understand
Chapter - Chapter 02 #15
Section: 2.01
Topic: Mendelian Inheritance

16. The first offspring from the parents are called
A. P.
B. F_1.
C. F_2.
D. testcross.
E. backcross.

Blooms Level 1: Remember
Chapter - Chapter 02 #16
Section: 2.02
Topic: Mendelian Inheritance

17. Which of the following terms is not a type of mating cross?
A. reciprocal
B. testcross
C. monohybrid
D. dihybrid
E. dominant

Blooms Level 2: Understand
Chapter - Chapter 02 #17
Section: 2.02
Topic: Mendelian Inheritance

18. A _____ is a cross between an unknown and a homozygous recessive.
A. testcross
B. dihybrid
C. monohybrid
D. backcross
E. controlled

Blooms Level 2: Understand
Chapter - Chapter 02 #18
Section: 2.02
Topic: Mendelian Inheritance

19. If an individual has 10 gene pairs, how many different gametes can be formed if three of the gene pairs are homozygous and the remaining seven gene pairs are heterozygous?
A. 49
B. 100
C. 128
D. 1024
E. 131,072

Blooms Level 3: Apply
Chapter - Chapter 02 #19
Section: 2.02
Topic: Mendelian Inheritance

20. If the parents of a family already have two boys, what is the probability that the next two offspring will be girls?
A. 1
B. 1/2
C. 1/3
D. 1/4
E. 1/8

Blooms Level 3: Apply
Chapter - Chapter 02 #20
Section: 2.02
Topic: Mendelian Inheritance

21. In some genetically engineered corn plants the dominant gene (BT) produces a protein that is lethal to certain flying insect pests that eat the corn plants. It was also found that the pollen could cause death in some flying insects. If the corn plant is heterozygous for BT, what proportion of the pollen would carry the dominant gene?
A. all pollen
B. 1/2
C. 1/3
D. 1/4
E. 1/8

Blooms Level 3: Apply
Chapter - Chapter 02 #21
Section: 2.02
Topic: Mendelian Inheritance

22. Suppose that in plants, smooth seeds (S) are dominant to wrinkled seeds (s) and tall plants (T) are dominant to short plants (t). A tall plant with smooth seeds was backcrossed to a parent that was short and wrinkled. What proportion of the progeny is expected to be heterozygous for tall and smooth?

A. 1/2
B. 1/4
C. 1/8
D. 1/16
E. 0

Blooms Level 3: Apply
Chapter - Chapter 02 #22
Section: 2.02
Topic: Mendelian Inheritance

23. Suppose that in plants, smooth seeds (S) are dominant to wrinkled seeds (s) and tall plants (T) are dominant to short plants (t). A tall plant with smooth seeds was backcrossed to a parent that was short and wrinkled. What proportion of the progeny is expected to be homozygous for short and wrinkled?

A. 1/2
B. 1/4
C. 1/8
D. 1/16
E. 0

Blooms Level 3: Apply
Chapter - Chapter 02 #23
Section: 2.02
Topic: Mendelian Inheritance

24. A rare recessive trait in a pedigree is indicated by which pattern of inheritance?
A. vertical
B. horizontal
C. diagonal
D. both vertical and horizontal
E. None of these is correct.

Blooms Level 2: Understand
Chapter - Chapter 02 #24
Section: 2.03
Topic: Mendelian Inheritance

25. Sickle cell anemia is a recessive trait in humans. In a cross between a father who has sickle cell anemia and a mother who is heterozygous for the gene, what is the probability that their first three children will have the normal phenotype?
A. 1/4
B. 1/2
C. none
D. 1/8
E. 1/16 will be albino

Blooms Level 3: Apply
Chapter - Chapter 02 #25
Section: 2.03
Topic: Mendelian Inheritance

26. The dominant trait, Huntington disease causes severe neural/brain damage at approximately age 40. A female whose mother has Huntington disease marries a male whose parents are normal. It is not known if the female has the disease. What is the probability that their firstborn will inherit the gene that causes Huntington disease?
A. 25%
B. 50%
C. 75%
D. 100%
E. 0%

Blooms Level 3: Apply
Chapter - Chapter 02 #26
Section: 2.03
Topic: Mendelian Inheritance

27. In a monohybrid cross AA × aa, what proportion of homozygotes is expected among the F_2 offspring?

A. 1/4
B. 1/2
C. 3/4
D. All are homozygotes.
E. None are homozygotes.

Blooms Level 3: Apply
Chapter - Chapter 02 #27
Section: 2.02
Topic: Mendelian Inheritance

28. In a monohybrid cross AA × aa, what proportion of heterozygotes is expected among the F_2 offspring?
A. 1/4
B. 1/2
C. 3/4
D. All are heterozygotes.
E. None are heterozygotes.

Blooms Level 3: Apply
Chapter - Chapter 02 #28
Section: 2.02
Topic: Mendelian Inheritance

29. In a dihybrid cross AAbb × aaBB, what proportion of homozygotes is expected among the F_2 offspring?
A. 1/4
B. 1/2
C. 3/4
D. All are homozygotes.
E. None are homozygotes.

Blooms Level 3: Apply
Blooms Level 4: Analyze
Chapter - Chapter 02 #29
Section: 2.02
Topic: Mendelian Inheritance

30. In a dihybrid cross AABB × aabb, what proportion of heterozygotes for both gene pairs is expected among the F_2 offspring?
A. 1/4
B. 1/2
C. 3/4
D. All are heterozygotes.
E. None are heterozygotes.

Blooms Level 3: Apply
Chapter - Chapter 02 #30
Section: 2.02
Topic: Mendelian Inheritance

31. In the dihybrid cross AaBb × aabb, what proportion of homozygotes is expected among the F_1 offspring?
A. 1/4
B. 1/2
C. 3/4
D. All are homozygotes.
E. None are homozygotes.

Blooms Level 3: Apply
Chapter - Chapter 02 #31
Section: 2.02
Topic: Mendelian Inheritance

32. In the dihybrid cross AaBb × aabb, what proportion of heterozygotes for both gene pairs is expected among the F_1 offspring?
A. 1/4
B. 1/2
C. 3/4
D. All are heterozygotes.
E. None are heterozygotes.

Blooms Level 3: Apply
Chapter - Chapter 02 #32
Section: 2.02
Topic: Mendelian Inheritance

33. Among the dihybrid crosses below, which will produce a 1:1 phenotypic ratio?
A. AABB × aabb
B. AaBb × AaBb
C. AaBb × aabb
D. AaBB × aaBB
E. AAbb × aaBB

Blooms Level 4: Analyze
Chapter - Chapter 02 #33
Section: 2.02
Topic: Mendelian Inheritance

34. Among the dihybrid crosses below, which will give a 1:1:1:1 ratio?
A. AABB × aabb
B. AaBb × AaBb
C. AaBb × aabb
D. AaBB × aaBB
E. AAbb × aaBB

Blooms Level 4: Analyze
Chapter - Chapter 02 #34
Section: 2.02
Topic: Mendelian Inheritance

35. Assume that in guinea pigs, dark brown fur (B) is dominant to black fur (b). If you mate a homozygous black guinea pig with a heterozygous brown guinea pig, what proportion of the progeny will be black?
A. none
B. 1/4
C. 1/2
D. 3/4
E. all

Blooms Level 3: Apply
Chapter - Chapter 02 #35
Section: 2.02
Topic: Mendelian Inheritance

36. Assume that in guinea pigs, dark brown fur (B) is dominant to black fur (b). If you mate a homozygous black guinea pig with a homozygous brown guinea pig, what proportion of the progeny will be heterozygous?
A. none
B. 1/4
C. 1/2
D. 3/4
E. all

Blooms Level 3: Apply
Chapter - Chapter 02 #36
Section: 2.02
Topic: Mendelian Inheritance

37. Assume that in guinea pigs, dark brown fur (B) is dominant to black fur (b). If you mate a black guinea pig with a homozygous brown guinea pig, what proportion of the progeny will be homozygous?
A. none
B. 1/4
C. 1/2
D. 3/4
E. all

Blooms Level 3: Apply
Chapter - Chapter 02 #37
Section: 2.02
Topic: Mendelian Inheritance

Match the following terms with the best definition
a. self-fertilization
b. cross fertilize
c. monohybrid crosses
d. artificial selection
e. reciprocal crosses

Blooms Level 2: Understand
Chapter - Chapter 02
Section: 2.01
Topic: Mendelian Inheritance

38. _____ The purposeful control of mating by choice of parents for the next generation.
d

Blooms Level 2: Understand
Chapter - Chapter 02 #38
Section: 2.01
Topic: Mendelian Inheritance

39. _____ Fertilization in which both egg and pollen come from the same plant, resulting in offspring with the same genetic traits as the single parent.
a

Blooms Level 2: Understand
Chapter - Chapter 02 #39
Section: 2.01
Topic: Mendelian Inheritance

40. _____ To brush the pollen from one plant onto the female organ of another plant, thereby creating offspring with the particular traits of the selected parent plants.
b

Blooms Level 2: Understand
Chapter - Chapter 02 #40
Section: 2.01
Topic: Mendelian Inheritance

41. _____ Crosses in which the male and female traits are reversed, thereby controlling whether a particular trait is transmitted by the egg or the pollen.
e

Blooms Level 2: Understand
Chapter - Chapter 02 #41
Section: 2.01
Topic: Mendelian Inheritance

42. _____ is/are a cross(es) between parents that differ in only one trait.
A. Self-fertilization
B. Cross fertilize
C. Monohybrid crosses
D. Artificial selection
E. Reciprocal crosses

Blooms Level 2: Understand
Chapter - Chapter 02 #42
Section: 2.01
Topic: Mendelian Inheritance

43. An allele that expresses its phenotype even when heterozygous with a recessive allele is termed
A. recessive.
B. recombinant.
C. dominant.
D. parental.
E. independent.

Blooms Level 1: Remember
Chapter - Chapter 02 #43
Section: 2.01
Topic: Mendelian Inheritance

44. An alternative form of a single gene is known as
A. parental.
B. dihybrid.
C. reciprocal.
D. allele.
E. recessive.

Blooms Level 1: Remember
Chapter - Chapter 02 #44
Section: 2.01
Topic: Mendelian Inheritance

45. The diploid cell formed by the fertilization of the egg by the sperm during sexual reproduction is a

A. reciprocal.
B. zygote.
C. dihybrid.
D. gamete.
E. monohybrid.

Blooms Level 1: Remember
Chapter - Chapter 02 #45
Section: 2.02
Topic: Mendelian Inheritance

46. A phenotype reflecting a new combination of genes occurring during gamete formation is called
A. a recombinant type.
B. an independent assortment.
C. heterozygous.
D. homozygous.
E. a multihybrid cross.

Blooms Level 2: Understand
Chapter - Chapter 02 #46
Section: 2.02
Topic: Mendelian Inheritance

47. The actual alleles present in an individual make up the individual's
A. recombinant types.
B. zygote.
C. dominant allele.
D. allele.
E. genotype.

Blooms Level 2: Understand
Chapter - Chapter 02 #47
Section: 2.01
Topic: Mendelian Inheritance

48. Mendel was the only botanist to work with large numbers of offspring, to count all offspring, subject his results to statistical analysis, and then compare his results with predictions based on his models.

FALSE

Blooms Level 4: Analyze
Chapter - Chapter 02 #48
Section: 2.01
Topic: General

49. The mating of parents with antagonistic traits produces hybrids.
TRUE

Blooms Level 4: Analyze
Chapter - Chapter 02 #49
Section: 2.01
Topic: Mendelian Inheritance

50. Mendel's law of segregation states that two alleles for each trait unite in a specific manner during gamete formation and therefore give rise to predictable observable traits.
FALSE

Blooms Level 4: Analyze
Chapter - Chapter 02 #50
Section: 2.02
Topic: Mendelian Inheritance

51. Dihybrid crosses helped reveal the Law of Independent Assortment.
TRUE

Blooms Level 4: Analyze
Chapter - Chapter 02 #51
Section: 2.02
Topic: Mendelian Inheritance

52. The Punnett square was introduced in 1906 by Reginald Punnett and provides a simple and convenient method of tracking possible combinations of gametes that might be produced in a given cross.
TRUE

Blooms Level 2: Understand
Chapter - Chapter 02 #52
Section: 2.02
Topic: Mendelian Inheritance

53. Using the product rule, one would calculate the probability of parents having six children who are all boys as $(½)^6$.
TRUE

Blooms Level 3: Apply
Chapter - Chapter 02 #53
Section: 2.02
Topic: Mendelian Inheritance

54. The sum rule states that the probability of both of two mutually exclusive events occurring is the sum of their individual probabilities.
FALSE

Blooms Level 4: Analyze
Chapter - Chapter 02 #54
Section: 2.02
Topic: Mendelian Inheritance

55. If you know the phenotype and the dominance relation of the alleles you can predict the genotype.

TRUE

Blooms Level 3: Apply
Chapter - Chapter 02 #55
Section: 2.02
Topic: Mendelian Inheritance

56. An individual can be a heterozygote for one trait and a homozygote for another.
TRUE

Blooms Level 2: Understand
Chapter - Chapter 02 #56
Section: 2.01
Topic: Mendelian Inheritance

57. A testcross is a cross between two heterozygotes.
FALSE

Blooms Level 2: Understand
Chapter - Chapter 02 #57
Section: 2.01
Topic: Mendelian Inheritance

58. At fertilization, in the mating of dihybrids, four different kinds of eggs can combine with four different kinds of pollen, producing a total of sixteen different genotypes.
FALSE

Blooms Level 2: Understand
Chapter - Chapter 02 #58
Section: 2.02
Topic: Mendelian Inheritance

59. During gamete formation, different pairs of alleles on different chromosomes segregate independently of each other.
TRUE

Blooms Level 2: Understand
Chapter - Chapter 02 #59
Section: 2.02
Topic: Mendelian Inheritance

60. If yellow and round phenotypes in peas are dominant, you know the genotype of all peas that are green and wrinkled.
TRUE

Blooms Level 3: Apply
Chapter - Chapter 02 #60
Section: 2.02
Topic: Mendelian Inheritance

61. A pedigree is a family history of a specific trait shown for a minimum of three generations.
TRUE

Blooms Level 2: Understand
Chapter - Chapter 02 #61
Section: 2.03
Topic: Mendelian Inheritance

62. Several single-gene disorders are more common in some populations of people than in others.
TRUE

Blooms Level 1: Remember
Chapter - Chapter 02 #62
Section: 2.03
Topic: Mendelian Inheritance

63. A lethal disorder does not include the inheritance of traits that cause death in adulthood.
FALSE

Blooms Level 2: Understand
Chapter - Chapter 02 #63
Section: 2.03
Topic: Mendelian Inheritance

64. The following symbols ~ = $^{\pm}$ indicate a consanguineous mating.
TRUE

Blooms Level 1: Remember
Chapter - Chapter 02 #64
Section: 2.03
Topic: Mendelian Inheritance

65. Cross-fertilization is the same as reciprocal cross.
FALSE

Blooms Level 2: Understand
Chapter - Chapter 02 #65
Section: 2.01
Topic: Mendelian Inheritance

66. The first filial generation is the offspring of parents.
TRUE

Blooms Level 2: Understand
Chapter - Chapter 02 #66
Section: 2.01
Topic: Mendelian Inheritance

67. A zygote is a fertilized egg.
TRUE

Blooms Level 2: Understand
Chapter - Chapter 02 #67
Section: 2.02
Topic: Mendelian Inheritance

68. A YY or yy genotype is called heterozygous.
FALSE

Blooms Level 2: Understand
Chapter - Chapter 02 #68
Section: 2.01
Topic: Mendelian Inheritance

69. When Mendel repeated his pea experiments in beans, he found flowers that ranged from white to pale violet to purple. This is due to bean flower color being determined by more than one gene.
TRUE

Blooms Level 2: Understand
Chapter - Chapter 02 #69
Section: 2.02
Topic: Mendelian Inheritance

70. In corn liguleless, (l^1) is recessive to ligules (L^1) and a green leaf (G) is dominant to the normal non-green (g). If a plant homozygous for liguleless and green leaves is crossed to one homozygous for non-green with ligules, predict the phenotypes and genotypes of the F_1.

Genotype	Phenotype
LlGg	Ligules/Green

Blooms Level 4: Analyze
Chapter - Chapter 02 #70
Section: 2.02
Topic: Mendelian Inheritance

71. In corn liguleless, (l^1) is recessive to ligules (L^1) and a green leaf (G) is dominant to the normal non-green (g). If a testcross is performed with a plant heterozygous for ligules and green leaves, what would be the phenotypes and genotypes of the progeny?

Genotype	Phenotype
LlGg	Ligules/Green
Llgg	Ligules/Non-green
llGg	Liguleless/Green
llgg	Liguleless/Non-green

Blooms Level 4: Analyze
Chapter - Chapter 02 #71
Section: 2.02
Topic: Mendelian Inheritance

72. In corn liguleless, (l^1) is recessive to ligules (L^1) and a green leaf (G) is dominant to the normal non-green (g). If a plant homozygous for liguleless and green leaves is crossed to one homozygous for non-green with ligules predict the phenotypes and genotypes of the F_2.

Genotype	Phenotype
1:LLGG	Ligules/Green
2:LLGg	Ligules/Green
2:LlGG	Ligules/Green
4:LlGg	Ligules/Green
1:LLgg	Ligules/Non-green
2:Llgg	Ligules/Non-green
1:llGG	Liguleless/Green
2:llGg	Liguleless/Green
1:llgg	Liguleless/Non-green

Blooms Level 4: Analyze
Chapter - Chapter 02 #72
Section: 2.02
Topic: Mendelian Inheritance

73. In *Drosophila,* forked bristles (fk) are recessive to normal (fk+) and glassy eyes (gls) are recessive to normal (gls+). If a homozygous wild-type male is mated to a forked-bristle, glassy-eye female, predict the genotypes and phenotypes of the F_1.

Genotype	Phenotype
fk+fk gls+gls	Wild type

Blooms Level 4: Analyze
Chapter - Chapter 02 #73
Section: 2.03
Topic: Mendelian Inheritance

74. In *Drosophila,* forked (fk) bristles are recessive to normal (fk+) and glassy eyes (gls) are recessive to normal (gls+). If an F_1 heterozygous female is backcrossed to the homozygous wild-type male parent, predict the genotypes and phenotypes of the offspring.

Genotype	Phenotype
$fk^+fk^+gls^+gls^+$	Wild type
$fk^+fk^+gls^+gls$	Wild type
$fk^+fk\ gls^+gls^+$	Wild type
$fk^+fk\ gls^+gls$	Wild type

Blooms Level 5: Evaluate
Chapter - Chapter 02 #74
Section: 2.02
Topic: Mendelian Inheritance

75. In *Drosophila,* forked (fk) bristles are recessive to normal (fk+) and glassy eyes (gls) are recessive to normal (gls+). If a homozygous wild-type male is mated to a forked-bristled, glassy-eyed female, predict the genotypes and phenotypes of the F_2.

Genotype	Phenotype
1:fk+fk+ gls+gls+	Wild type
2:fk+fk+ gls+gls	Wild type
2:fk+fk gls+gls+	Wild type
4:fk+fk gls+gls	Wild type
1:fk+fk+ glsgls	Glassy eyes
2:fk+fk glsgls	Glassy eyes
1:fkfk gls+gls+	Forked bristles
2:fkfk gls+gls	Forked bristles
1:fkfkglsgls	Forked bristles and glassy eyes

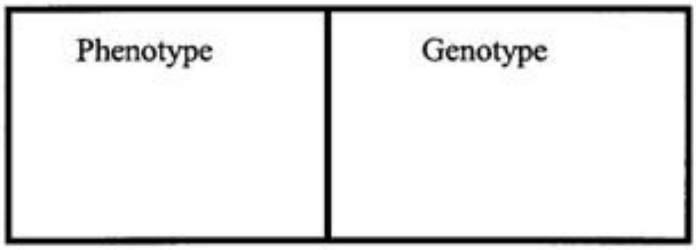
Blooms Level 5: Evaluate
Chapter - Chapter 02 #75
Section: 2.02
Topic: Mendelian Inheritance

76. A rosy-eyed *Drosophila* with wild-type bristles was crossed with a forked *Drosophila* with wild-type eyes. The F_1 were wild type for both traits, whereas the F_2 consisted of 306 wild-type, 94 rosy-eyed, 102 fork-bristled, and 33 forked-bristled and rosy-eyed flies. Infer the genotypes of the parents.

Both parents are homozygotes; AAbb × aaBB.

Blooms Level 5: Evaluate
Chapter - Chapter 02 #76
Section: 2.02
Topic: Mendelian Inheritance

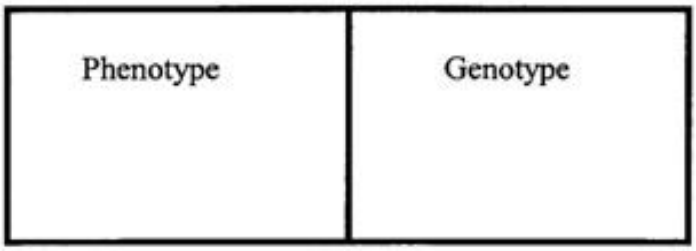
77. In pecans, the outer shell may be thick (T) or thin (t). The shell of pecans is the pericarp. If you use the pollen from a homozygous thick shell to pollinate a thin-shell tree, what shell type would form on the pecans of this tree following the cross?



Phenotype	Genotype
Thin	tt

Blooms Level 5: Evaluate
Chapter - Chapter 02 #77
Section: 2.02
Topic: Mendelian Inheritance

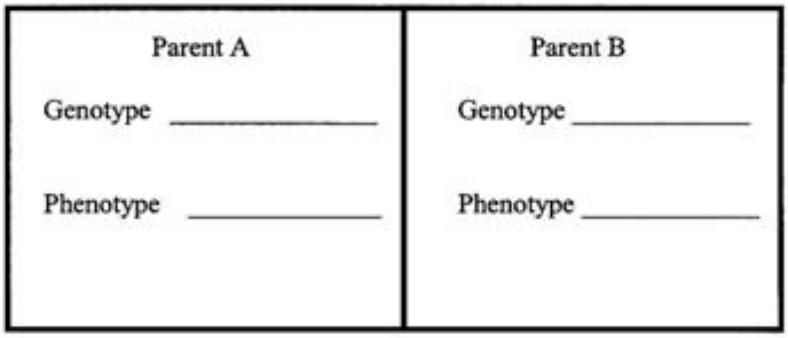
78. If you use the seed from the pecans of the above cross to produce an F_2, what shell type will form on the pecans of the F_1 plant?



Phenotype	Genotype
Thick	Tt

Blooms Level 5: Evaluate
Chapter - Chapter 02 #78
Section: 2.02
Topic: Mendelian Inheritance

79. After a cross between two corn plants, the F_1 plants all had a dwarfed phenotype. The F_2 consisted of 1,207 dwarf plants and 401 tall plants. Identify the phenotypes and genotypes of the two parents.



Parent A	Parent B
DD/dwarf	dd/tall

Blooms Level 5: Evaluate
Chapter - Chapter 02 #79
Section: 2.02
Topic: Mendelian Inheritance

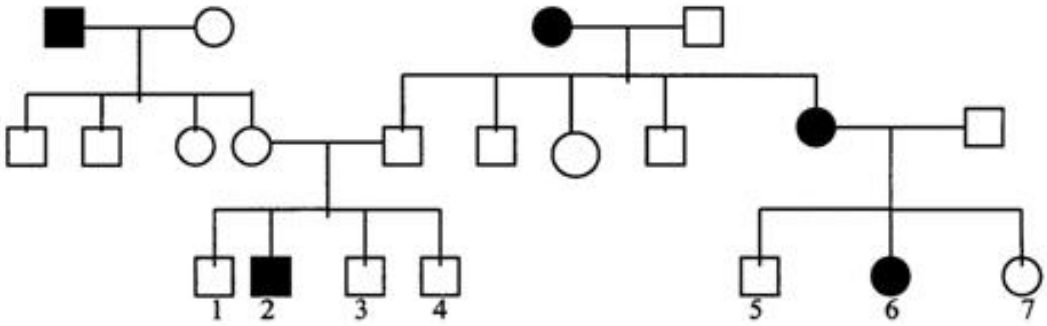
80. After a cross between two mice, the F_1 offspring all had the same phenotype. The F_2 consisted of 91 short tails and 29 normal tails. Identify the phenotypes and genotypes of the two parent mice.

Parent A	Parent B
Genotype _____	Genotype _____
Phenotype _____	Phenotype _____

Parent A	Parent B
SS/Short tails	ss/Long tails

Blooms Level 4: Analyze
Chapter - Chapter 02 #80
Section: 2.02
Topic: Mendelian Inheritance

Below is a pedigree for a human trait. Shaded symbols are for individuals exhibiting the trait. (A) Identify the mode of inheritance of the trait. (B) Apply the laws of probability to calculate the probability that the offspring of a marriage between unaffected cousins will exhibit the trait.



Blooms Level 5: Evaluate
Chapter - Chapter 02
Section: 2.03
Topic: Mendelian Inheritance

81. (A) Mode of inheritance

Recessive

Blooms Level 5: Evaluate
Chapter - Chapter 02 #81
Section: 2.03
Topic: Mendelian Inheritance

82. (B) Probability

1/3

Blooms Level 5: Evaluate
Chapter - Chapter 02 #82
Section: 2.03
Topic: Mendelian Inheritance

83. In some plants, a purple pigment is synthesized from a colorless precursor. In a cross between two plants, one purple and the other colorless, an F_1 generation was produced that was all-purple. The F_2 produced from the F_1 had 775 purple, 200 red and 65 colorless. What is the genotype of the parents?

Purple parent	Colorless parent

The ratio is 12:3:1; Parents: AABB × aabb

Blooms Level 5: Evaluate
Chapter - Chapter 02 #83
Section: 2.02
Topic: Mendelian Inheritance

84. Short hair in rabbits is produced by a dominant gene (l^+) and long hair by its recessive allele (l). Black hair results from the action of a dominant gene (b^+) and brown hair from its allele (b). Determine the genotypic and the corresponding phenotypic ratios of the F_1 from a cross of a female rabbit with brown hair and a male rabbit with long hair. Assume that the female is homozygous for short hair and the male is homozygous for black hair.

Genotype	Phenotype
l+l b+b	short, black

Blooms Level 4: Analyze
Chapter - Chapter 02 #84
Section: 2.02
Topic: Mendelian Inheritance

85. Short hair in rabbits is produced by a dominant gene (l^+) and long hair by its recessive allele (l). Black hair results from the action of a dominant gene (b^+) and brown hair from its allele (b). Determine the genotypic and the corresponding phenotypic ratios of the F_2 offspring, beginning with a parental cross of a female rabbit with brown hair and a male rabbit with long hair. Assume that the P female is homozygous for short hair and the P male is homozygous for black hair.

#	Genotype	Phenotype
1	l+l+ b+b+	Short Black
2	l+l b+b+	Short Black
2	l+l+ b+b	Short Black
4	l+l b+b	Short Black
1	l+l+ bb	Short Brown
2	l+l bb	Short Brown
1	ll b+b+	Long Black
2	ll b+b	Long Black
1	llbb	Long Brown

Blooms Level 4: Analyze
Chapter - Chapter 02 #85
Section: 2.02
Topic: Mendelian Inheritance

86. Stem color of tomato plants is known to be under the genetic control of at least one pair of alleles such that A- results in the production of anthocyanin pigment (purple stem). The recessive genotype aa lacks this pigment and hence is green. The production of two locules (seed chambers) in the tomato fruit is controlled by the dominant allele M, and multiple locules is determined by mm. Determine the genotypic and phenotypic ratios of the F_1 from a cross between an inbred tomato plant with a purple stem and fruit with two locules crossed to a tomato plant with a green stem and fruit with multiple locules.

Genotype	Phenotype
AaMm	Purple, 2 locules

Blooms Level 4: Analyze
Blooms Level 5: Evaluate
Chapter - Chapter 02 #86
Section: 2.02
Topic: Mendelian Inheritance

87. Stem color of tomato plants is known to be under the genetic control of at least one pair of alleles such that A- results in the production of anthocyanin pigment (purple stem). The recessive genotype aa lacks this pigment and hence is green. The production of two locules (seed chambers) in the tomato fruit is controlled by the dominant allele M, and multiple locules is determined by mm. Determine the genotypic and phenotypic ratios of the F_2 offspring beginning with a parental cross between an inbred tomato plant that has a purple stem and fruit with two locules and a tomato plant that has a green stem and fruit with multiple locules.

#	Genotype	Phenotype
1	AAMM	Purple, 2 locules
2	AaMM	Purple, 2 locules
2	AAMm	Purple, 2 locules
4	AaMm	Purple, 2 locules
1	aaMM	Green, 2 locules
2	aaMm	Green, 2 locules
1	AAmm	Purple, Multi locules
2	AAMm	Purple, Multi locules
1	aamm	Green, Multi locules

Blooms Level 5: Evaluate
Chapter - Chapter 02 #87
Section: 2.02
Topic: Mendelian Inheritance

88. What does a diamond symbol ◊ in a pedigree indicate?

Sex unspecified

Blooms Level 1: Remember
Chapter - Chapter 02 #88
Section: 2.03
Topic: Mendelian Inheritance

89. What does a vertical pattern of inheritance in a pedigree likely indicate?

Rare dominant trait

Blooms Level 1: Remember
Chapter - Chapter 02 #89
Section: 2.03
Topic: Mendelian Inheritance

90. Calculate the probability of the production of a homozygous recessive genotype for the following cross: AaBbccddEeFf × AaBbCcddEeFf

¼ × ¼ × ½ × 1 × ¼ × ¼ = 1/512

Blooms Level 3: Apply
Chapter - Chapter 02 #90
Section: 2.02
Topic: Mendelian Inheritance

91. Calculate the probability of either all-dominant or all-recessive genotypes for the alleles A, B, E, and F in the following cross: AaBbccddEeFf × AaBbCcddEeFf

(¾ × ¾ × ¾ × ¾) + (¼ × ¼ × ¼× ¼) = 81/256 + 1/256 = 82/256 = 41/128

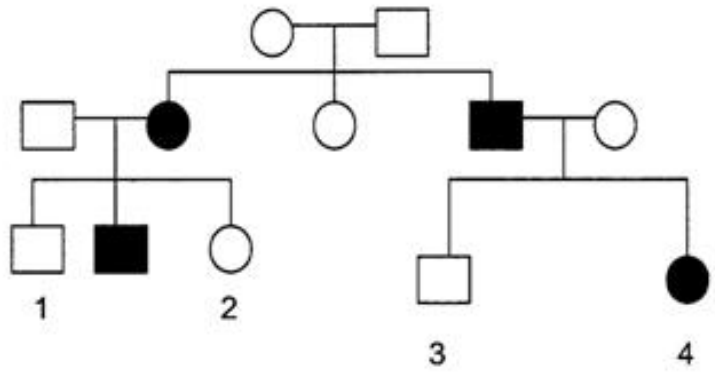
Blooms Level 3: Apply
Chapter - Chapter 02 #91
Section: 2.02
Topic: Mendelian Inheritance

92. What are the four general themes that have arisen from Mendel's work?

Variation, as expressed in alternative forms of a trait, is widespread in nature. Observable variation is essential for following inheritance of traits. Variation is not distributed by chance alone but is inherited according to the genetic tenet that "like begets like." Mendel's laws apply to all sexually reproducing organisms.

Blooms Level 2: Understand
Chapter - Chapter 02 #92
Section: 2.01
Topic: General

What are the possible genotypes of persons 1, 2, 3 and 4?



Blooms Level 3: Apply
Chapter - Chapter 02
Section: 2.03
Topic: Mendelian Inheritance

93. <u>Person 1</u>

Aa

Blooms Level 3: Apply
Chapter - Chapter 02 #93
Section: 2.03
Topic: Mendelian Inheritance

94. Person 2

Aa

Blooms Level 3: Apply
Chapter - Chapter 02 #94
Section: 2.03
Topic: Mendelian Inheritance

95. Person 3

Aa

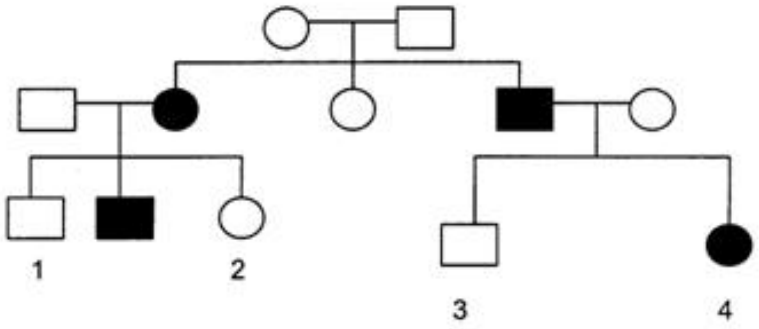
Blooms Level 3: Apply
Chapter - Chapter 02 #95
Section: 2.03
Topic: Mendelian Inheritance

96. Person 4

aa

Blooms Level 3: Apply
Chapter - Chapter 02 #96
Section: 2.03
Topic: Mendelian Inheritance

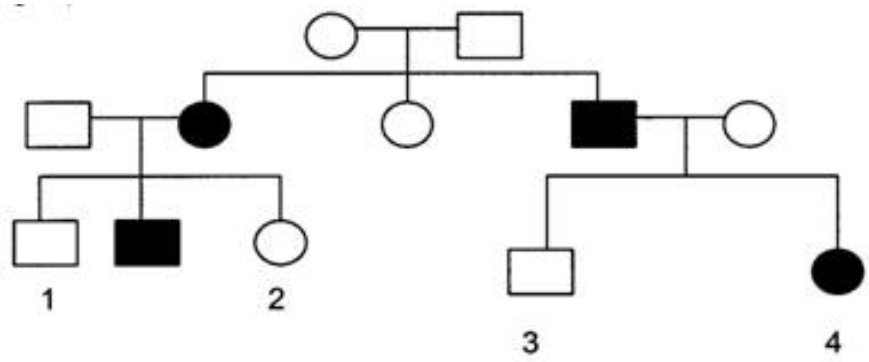
97. Below is a pedigree of a human genetic disease in which solid color indicates stricken individuals. Apply the laws of probability and calculate the probability the offspring of the cousin marriage 2 × 3 will exhibit the disease.



The trait is a recessive trait, and both cousins are carriers: ¼

Blooms Level 4: Analyze
Chapter - Chapter 02 #97
Section: 2.03
Topic: Mendelian Inheritance

98. Below is a pedigree of a human genetic disease in which solid color indicates stricken individuals. Apply the laws of probability and calculate the probability the offspring of the cousin marriage 1 × 4 will exhibit the disease.



The trait is a recessive trait, and cousin 1 is heterozygous while cousin 4 is homozygous affected: ½

Blooms Level 4: Analyze
Chapter - Chapter 02 #98
Section: 2.03
Topic: Mendelian Inheritance

99. A youngster has dozens of pet mice and asks you why their coat colors are so different. He explains that his favorite color is black with white patches and wonders how he can get more of them, yet his favorite mice are actually the "nice" white ones who are gentler than the active nippy black ones. You decide to give a simple genetics lesson. Help the youngster set up an artificial selection for "nice" black mice with white spots, including an indication of expected results and an interpretation of the data.

Breed male black mice with female white mice and male white mice with female black mice. Interbreed the offspring. Test all black mice with white spots for gentle behavior and breed the gentlest males to the gentlest females. If the genes for coat color and gentle behavior are unlinked, are not closely linked, or are not the same gene, this experimental design will result in the production of gentle mice that are black with white spots. If this selection is continued for numerous generations, the genes will become fixed in the population and gentle black mice with white spots will always result.

Blooms Level 6: Create
Chapter - Chapter 02 #99
Section: 2.02
Topic: Mendelian Inheritance

100. As an owner of an orchard you realize that the selective breeding of apple trees to produce the most beautiful red apples have left customers displeased with the now bland-tasting beautiful apples. What has been indicated about the two traits? How would you as an orchard owner fix the problem for the long term?

The genes for taste and red color are not linked. To fix the beautiful but tasteless apple problem, a rederivation of the apples is necessary. It will be necessary to cross trees with beautiful red apples to trees with tasty apples. Each generation of trees should be observed for both tasty and colorful fruit. Then crosses should be made between the flowers of trees with fruit that is the most tasty and colorful. As you might imagine, fixing the problem in your orchard will take a very long time using this method.

Blooms Level 6: Create
Chapter - Chapter 02 #100
Section: 2.02
Topic: Mendelian Inheritance

101. You are out on a nature walk up in the mountains and you find a pretty wildflower in the lower altitude that is short and bushy with small, fragrant, bright purple flowers. In the higher altitude you find what seems to be the same plant, yet it is tall and sparse with larger flowers of the same color and fragrance. A) Set up an experiment to test the hypothesis that the plants are different due to genetic but not environmental influences. B) Is it possible to tell if both genetic and environmental effects occur?

A) Assuming these are not endangered plants and you are not in a protected area, obtain several specimens from each location. Plant seeds of both types of plants in both low- and high-altitude locations. Observe the offspring. If the offspring look the same as their parental stock, then the differences are simply genetic in nature. If the offspring look short and bushy with small fragrant, bright purple flowers in the lower altitude, but tall and sparse with larger flowers of the same color and fragrance in the higher altitude, then the differences are due to environmental influences. B) Yes, a combination of the traits would indicate that both environmental and genetic influences play a role in the differences you have identified.

Blooms Level 6: Create
Chapter - Chapter 02 #101
Section: 2.02
Topic: Mendelian Inheritance

102. You wish to know the genotype of some carrot plants that you have grown in your garden so that you might grow more of them. They have reddish orange flesh, are sweet in taste, long in root, and short in leaf. Using classical genetic techniques how would you determine the genotype?

You need to determine the dominant/recessive nature of each trait. Set up crosses between reddish orange, sweet tasting, long in root, and short in leaf carrot plants and true orange, plain tasting, short in root, and long in leaf carrot plants to determine each dominant trait. Then create a "tester plant" that is recessive for all four traits. Cross your favorite carrot plants with the tester and observe the offspring. The traits shown in the offspring are indicative of the genotype of your original carrot plant.

Blooms Level 6: Create
Chapter - Chapter 02 #102
Section: 2.02
Topic: Mendelian Inheritance

103. You are talking to your father about your relatives and he shares with you that there is a late-onset disease that seems to run in his family. What could you do to determine your probability of having this late-onset disease?

Create a pedigree of your family tree for the late-onset disease going back at least three but as many generations as possible. Based on the family pedigree, you need to determine whether the trait is recessive or dominant, and autosomal or sex-linked. Use the product rule to determine the probability of your having inherited the trait. Keep in mind that individuals not old enough to exhibit the trait should be diagramed as unknowns on your pedigree, and your probability of inheriting the disease may depend on whether an unknown individual carries the trait.

Blooms Level 6: Create
Chapter - Chapter 02 #103
Section: 2.03
Topic: Mendelian Inheritance

2 Summary

Category	*# of Questions*
Blooms Level 1: Remember	16
Blooms Level 2: Understand	32
Blooms Level 3: Apply	26
Blooms Level 4: Analyze	18
Blooms Level 5: Evaluate	12
Blooms Level 6: Create	5
Chapter - Chapter 02	107
Section: 2.01	25
Section: 2.02	56
Section: 2.03	26
Topic: General	5
Topic: Mendelian Inheritance	102