Mendelian Genetics SI

1. In sheep, eye color is controlled by a single gene with two alleles. When a homozygous brown-eyed sheep is crossed with a homozygous green-eyed sheep, blue-eyed offspring are produced. If the blue-eyed sheep are mated with each other, what percent of their offspring will most likely have blue eyes?

   A) 0%   B) 25%   C) 50%   D) 75%   E) 100%

2. One hundred and twenty offspring are counted in a genetic cross. Ninety appear to show the dominant phenotype and thirty appear recessive. What are the most likely genotypes of the parents?

   A) AA, aa   B) Aa, aa
   C) Aa, Aa   D) aa, aa
   E) AA, Aa

3. A genotype can be described as

   A) the genetic makeup of an organism
   B) part of a chromosome that codes for a certain hereditary trait
   C) the outward, visible expression of the hereditary makeup of an organism
   D) the shifting of gene positions in chromosomes
   E) a sequence of three adjacent nucleotides that codes for a single amino acid

4. Two parents are heterozygous for dominant trait A and recessive trait a. If they mate, the probability of producing an offspring who displays the dominant trait is

   A) 100% B) 75%   C) 50%   D) 25%   E) 0%

5. A testcross

   A) determines whether a dominant-appearing individual is homozygous dominant or heterozygous dominant for that trait
   B) suggests that the unknown dominant-appearing individual is homozygous if any of the test-cross offspring are recessive
   C) suggests that the unknown dominant-appearing individual is heterozygous if none of the testcross offspring are recessive
   D) is used to determine whether an individual is homozygous recessive or homozygous dominant for a given trait
   E) is used to determine whether or not a trait is sex-linked

6. Two plants with pink flowers are crossed, and the F1 show the following ratio: 1 red: 2 pink: 1 white. The best explanation for this phenomenon is

   A) segregation
   B) codominance
   C) mutation
   D) incomplete dominance
   E) independent assortment

7. A particular flower inherits color via incomplete dominance. A cross between a homozygous blue flower (BB) and a homozygous red flower (RR) yields 100% purple flowers. If a cross between a purple flower and a red flower is performed, what percentage of the progeny will be purple flowers?

   A) 0%   B) 25%   C) 50%   D) 75%   E) 100%

8. In reference to blood types, sometimes both the A allele and the B allele are expressed. Which of the following terms best explains this?

   A) Linked genes
   B) Incomplete dominance
   C) Multiple alleles
   D) Codominance
   E) Polygenetic inheritance

9. When two inherited alleles are expressed at the same time, which of the following is exhibited?

   A) Linkage
   B) Epistasis
   C) Codominance
   D) Incomplete Dominance
   E) Multiple Alleles

10. Blood types are an example of

    A) Multiple alleles
    B) Sex-linked traits
    C) Recessive traits
    D) Polygenic inheritance
    E) Incomplete dominance

11. Which genotype illustrates codominance of alleles that control blood type in humans?

    A) ii B) $I^A i$ C) $I^B I^B$ D) $I^A I^B$

12. The puppies shown in the photograph below are all from the same litter.

The differences seen with this group of puppies are most likely due to

A) overproduction and selective breeding
B) mutations and elimination of genes
C) evolution and asexual reproduction
D) sorting and recombination of genes

13. A cross between two mice with long tails and brown fur produced the four types of offspring listed below:

long tailed with brown fur
long tailed with white fur
short tailed with brown fur
short tailed with white fur

Which genetic mechanism best explains the results of this cross?

A) intermediate inheritance
B) gene linkage
C) independent assortment
D) crossing-over

14. 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%

15. A boy has brown hair and blue eyes, and his brother has brown hair and brown eyes. The fact that they have different combinations of traits is best explained by the concept known as

A) multiple alleles
B) incomplete dominance
C) sex linkage
D) independent assortment

16. In humans, the gene for polydactyly (having extra fingers or toes) is dominant over the gene for the normal number of digits. If parents who are both homozygous dominant for polydactyly have four children, how many of these children would most likely have extra fingers or toes?

A) 0   B) 2   C) 3   D) 4

17. In a certain species of mouse, gray fur (G) is dominant over cream-colored fur (g). If a homozygous gray mouse is crossed with a cream-colored mouse, the genotype of the F_1 generation will most likely be

A) 100% Gg
B) 50% GG and 50% gg
C) 25% GG, 50% Gg, and 25% gg
D) 75% Gg and 25% gg

18. Kernel color in corn is a trait determined by two alleles. The dominant allele (P) produces a purple color, and the recessive allele (p) produces a yellow color. The diagram below shows an ear of corn produced by crossing two corn plants. The shaded kernels are purple, and the unshaded ones are yellow.
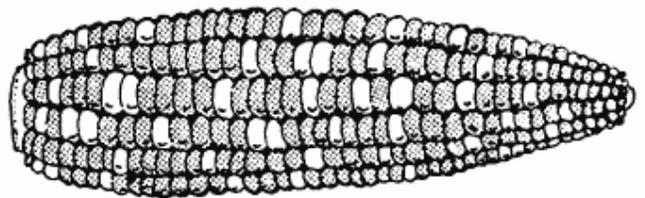
What can the yellow kernels *best* be described as?

A) homozygous dominant
B) heterozygous
C) hybrid
D) homozygous recessive

19. In squirrels, the gene for gray fur (*G*) is dominant over the gene for black fur (*g*). If 50% of a large litter of squirrels are gray, the parental cross that produced this litter was most likely

A) *GG* × *Gg* B) *GO* × *GO*
C) *Gg* × *gg* D) *gg* × *gg*

20. In a population of dogs, curly hair is dominant over straight hair. If two parents are heterozygous for this trait, what is the probability that any of their offspring will have straight hair?

A) 0% B) 25%
C) 75% D) 100%

21. In dogs, wire hair (*D*) is dominant over smooth hair (*d*). If two wire-haired dogs produce a smooth-haired pup, the genotypes of the parent dogs are most likely

A) *DD* and *Dd* B) *Dd* and *Dd*
C) *DD* and *DD* D) *Dd* and *dd*

22. The gene for tallness (*T*) is dominant over the gene for shortness (*t*) in pea plants. A homozygous dominant pea plant is crossed with a heterozygous pea plant, and 200 seeds are produced. Approximately how many of these seeds can be expected to produce plants that are homozygous dominant?

A) 0 B) 50 C) 100 D) 200

23. 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

24. In pea plants, the trait for tall stems is dominant over the trait for short stems. If two heterozygous tall plants are crossed, what percentage of the offspring would be expected to have the same *phenotype* as the parents?

A) 25% B) 50%
C) 75% D) 100%

25. The chart below indicates a method of representing traits in pea plants.

Symbol for Gene	Trait Represented
T	tall
t	short
Y	yellow
y	green

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*

26. Base your answer to the following question on the Punnett square below which shows the cross between two squash plants.

	D	D
d	Dd	Dd
d	Dd	Dd

KEY
DD = Disc-shaped squash
Dd = Disc-shaped squash
dd = Round squash

Which genetic principle is *best* illustrated by the phenotype of the offspring?

A) codominance
B) intermediate inheritance
C) independent assortment
D) dominance

27. In watermelon plants the allele for solid green fruit (*G*) is dominant over the allele for striped fruit (*g*). Pollen from a flower of a homozygous green watermelon plant is used to pollinate a flower from a heterozygous green watermelon plant. What percent of the offspring of this cross will bear striped watermelons?

A) 0% B) 25%
C) 50% D) 100%

28. Which term *best* describes genes carried only on the *X*-chromosome?

A) hybrid B) codominant
C) autosomal D) sex-linked

29. *B* represents the dominant allele for a trait and *b* represents the recessive allele. In which pair of crosses must all of the offspring produced have the same phenotype?

A) *Bb* × *bb* and *Bb* × *Bb*
B) *Bb* × *bb* and *BB* × *Bb*
C) *BB* × *Bb* and *BB* × *bb*
D) *BB* × *BB* and *Bb* × *Bb*

30. A geneticist wishes to determine if a red rose of a certain variety is homozygous for the color red. If red is dominant over white, the red rose should be cross-pollinated with roses of the same variety that are

A) homozygous red
B) homozygous white
C) heterozygous red
D) heterozygous pink

31. A cross between two plants that have pink flowers produced plants that have red, pink, or white flowers. Which is the most likely explanation for these results?

A) Intermediate inheritance involved alleles that were not clearly dominant or recessive.
B) Mutations occurred during gametogenesis.
C) Crossing-over of white and red alleles occurred during meiosis.
D) Nondisjunction of homologous pairs of chromosomes resulted in the production of abnormal offspring.

32. Two generations of offspring of four o'clock plants are shown in the diagram below.
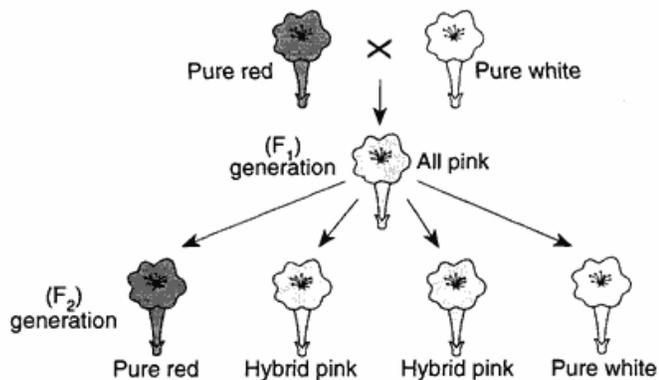
The phenotypic ratio of the F_2 generation is

A) 3:1   B) 2:1:2   C) 2:1   D) 1:2:1

33. Crosses between white-coated cattle ($C^W C^W$) and red-coated cattle ($C^R C^R$) produce roan offspring ($C^R C^W$). This type of inheritance pattern is known as

A) multiple allele inheritance
B) crossing-over
C) sex linkage
D) codominance

Base your answers to questions **34** and **35** 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.
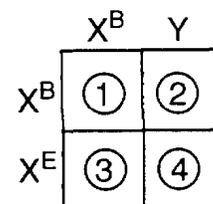
34. Calico coat color is most likely due to

A) codominant autosomal genes
B) codominant sex-linked genes
C) recessive autosomal genes
D) recessive sex-linked genes

35. Yellow male offspring are represented by

A) 1   B) 2   C) 3   D) 4

36. The sex of a person depends on

A) the genetic makeup of autosomes found in the egg cell
B) the genetic makeup of autosomes found in the sperm cell
C) whether the unfertilized egg contains an *X*- or *Y*-chromosome
D) whether the sperm that fertilizes the egg contains an *X*- or *Y*-chromosome

37. A normal human egg cell contains

A) 22 autosomes and one X-chromosome
B) 22 autosomes and one Y-chromosome
C) 44 autosomes and XX-chromosomes
D) 44 autosomes and XY-chromosomes

38. The Y-chromosome carries the SRY gene that codes for the production of testosterone in humans. Occasionally a mutation occurs resulting in the SRY gene being lost from theY-chromosome and added to the X-chromosome, as shown in the diagram below.

Normal female — X X
Normal male — X Y
Female who appears to be a male — X X
Male who appears to be a female — X Y
Section containing SRY gene
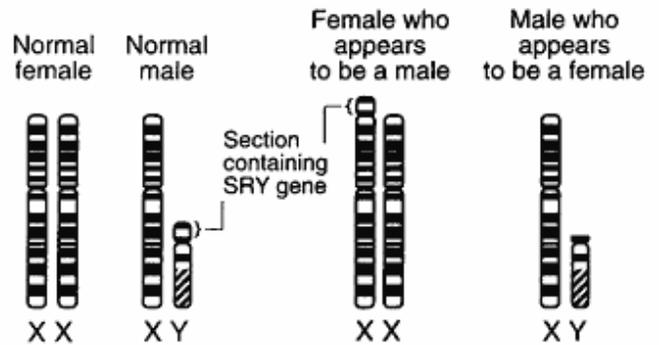
Based on the diagram, which statement is correct?

A) The production of testosterone influences the development of male characteristics.
B) Reproductive technology has had an important influence on human development.
C) Normal female characteristics develop from a single X-chromosome.
D) Male characteristics only develop in the absence of X-chromosomes.

39. In fruit flies, red eye color (R) is dominant and white eye color (r) is recessive. The allele for eye color is carried on the X-chromosome. Which cross would most likely produce 50% white-eyed males and 50% red-eyed males?

A) $X^R X^R \times X^R Y$ B) $X^R X^R \times X^r Y$
C) $X^R X^r \times X^r Y$ D) $X^r X^r \times X^R Y$

40. A man with normal color vision married a woman with normal color vision. The father of the woman was colorblind. If this couple had a daughter, what is the chance this child would be colorblind?

A) 0%   B) 25%
C) 50%   D) 100%

Answer Key
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1.   C
2.   C
3.   A
4.   B
5.   A
6.   D
7.   C
8.   D
9.   C
10.   A
11.   D
12.   D
13.   C
14.   B
15.   D
16.   D
17.   A
18.   D
19.   C
20.   B
21.   B
22.   C
23.   C
24.   C
25.   B
26.   D
27.   A
28.   D
29.   C
30.   B
31.   A
32.   D
33.   D
34.   B
35.   D
36.   D

37.   A
38.   A
39.   C
40.   A