Mendelian Genetics 2015-16

Name: _____ **Date:** _____

Students are to provide explanations for their answers before submission.

1. If Jessica has light eyes (*bb*) and both of her parents have dark eyes (*Bb*) which statement is true? 1. _____

   A. Jessica inherited both genes from her father.

   B. Jessica inherited both genes from her mother.

   C. Jessica inherited one recessive form of the gene from each parent.

   D. Jessica inherited one dominant form of the gene from each parent.

2. Which statement about the genetic traits of humans is true? 2. _____

   A. Recessive forms of genes are always visible in offspring.

   B. Visible traits are the same for each member of a family.

   C. Dominant forms of genes are always inherited from both parents.

   D. Visible traits depend on the dominant and recessive forms of genes from each parent.

3. How did the work of Gregor Mendel change the scientific explanation about how traits were inherited? 3. _____

   A. Mendel showed that every trait is controlled by two inherited elements.

   B. Mendel showed that an organism contains miniature forms of its future offspring.

   C. Mendel showed that traits skip a generation and are inherited grandparent to grandchild.

   D. Mendel showed that tiny particles from every part of the body of each parent became blended and produced an individual with the characteristics of both.

4. In fruit flies, the allele for red eyes (R) is dominant and the allele for sepia eyes (r) is recessive. A female fly has red eyes. How can you determine the female fly's genotype? 4. _____

A. Mate the female with a male with red eyes. If any of the offspring have sepia eyes, she must be RR.

B. Mate the female with a male with red eyes. If any of the offspring have red eyes, she must be Rr.

C. Mate the female with a male with sepia eyes. If any of the offspring have sepia eyes, she must be Rr.

D. Mate the female with a male with sepia eyes. If any of the offspring have red eyes, she must be RR.

5. Fruit flies have 3 chromosomes plus sex chromosomes (X and Y). Mutations occurred within four different cells of an individual female fruit fly as shown in the table below. 5. _____

Cell Type	Chromosome	Trait	Normal Phenotype	Mutated Phenotype
exoskeleton	2	head features	eyes present	eyes are absent
gamete	2	wing shape	straight wings	curly wings
muscle	X	body color	tan body	yellow body
nerve	3	antenna shape	normal antennae	leg-shaped antennae

Which of these mutations could be passed on to this fruit fly's offspring?

A. absent eyes

B. curly wings

C. yellow body

D. leg-shaped antennae

6. In fruit flies, gray body color (G) is dominant over black body color (g). What kind of offspring would you expect from parents who are both heterozygous for body color (Gg × Gg)? 6. _____

	G	g
G		
g		

A. 0% gray, 100% black

B. 25% gray, 75% black

C. 75% gray, 25% black

D. 100% gray, 0% black

7. In human beings, earlobes can be free or attached. Some people can roll their tongues while others cannot. 7. _____

The genotype and phenotype of two parents are shown below.

	Male	Female
Genotype	**FFTt**	**Fftt**
Phenotype	**Free earlobes, Can roll tongue**	**Free earlobes, Cannot roll tongue**

KEY:
F = Free earlobe
f = Attached earlobe
T = Can roll tongue
t = Cannot roll tongue

Which trait *cannot* be transferred by this mother?

A. Free earlobes

B. Attached earlobes

C. Cannot roll tongue

D. Can roll tongue

8. Children would *not* be able to roll their tongues if they inherited a _____. 8. _____

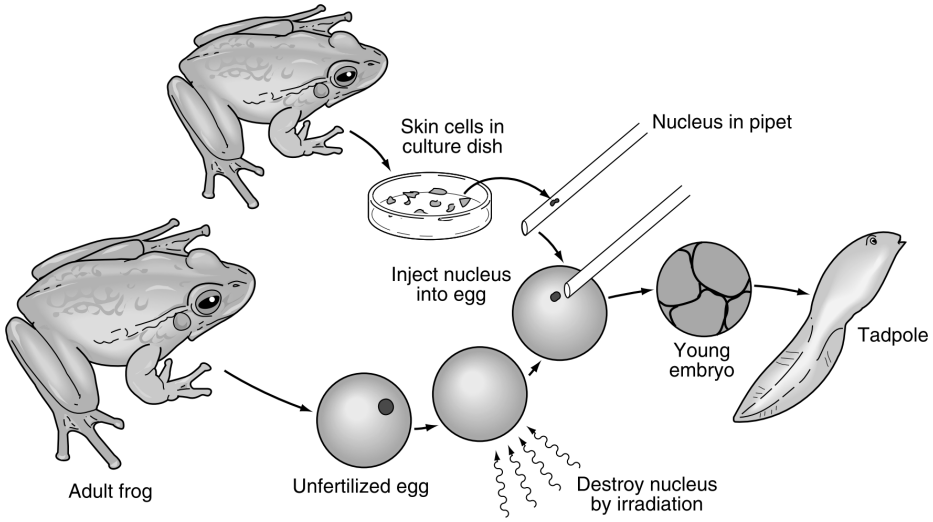
A. t allele from both parents

B. T allele from both parents

C. T allele from the mother and the t allele from the father

D. t allele from the mother and the T from the father

9. The diagram below shows the procedure scientists used to clone a frog from the nucleus of a skin cell. 9. _____



The tadpole produced by the cloning process will be genetically _____.

A. most similar to the frog the egg cell came from

B. most similar to the frog the skin cell came from

C. different from both frogs that the cells came from

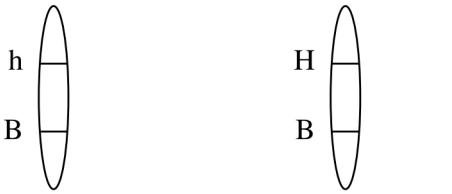
D. identical to both frogs that the cells came from

10. Rayna is collecting seeds from a sunflower. She notices that most of the leaves on the sunflower plant have patterns of holes made by chewing insects, as shown in the picture below. 10. _____

Next year, she will plant the sunflower seeds that she has collected. How many of the sunflower plants that grow are expected to inherit the chewed leaf pattern?

A. all of the plants
B. most of the plants
C. half of the plants
D. none of the plants

11. The figures below represent two chromosomes from an animal. 11. _____



Chromosome #6 from father

Chromosome #6 from mother

Using the table below that describes the traits carried on Chromosome #6, which trait can the animal inherit only from its mother?

Genes on Chromosome #6	Trait
H	long hair
h	short hair
B	black hair
b	white hair

A. long hair B. black hair C. white hair D. short hair

12. Jerome crossed two purple-flowered plants. The offspring produced from this cross had either white flowers or purple flowers, as shown in the table below. 12. _____

Number of Offspring	Flower Color
10	Purple
3	White

Which of the following statements *best* explains why some of the offspring have white flowers?

A. These offspring were created by asexual reproduction.

B. These offspring were produced in a dark environment.

C. These offspring inherited a DNA sequence coding for white flowers from each parent plant.

D. These offspring inherited a DNA sequence coding for white flowers from only one parent plant.

13. Which of the following is an example of codominance in genetic traits? 13. _____

A. A tall pea plant and a short pea plant produce tall pea plants.

B. An orange cat and a black cat produce an orange-and-black kitten.

C. A blue-eyed man and a brown-eyed woman produce a blue-eyed child.

D. A color-blind woman and a man with normal vision produce a color-blind son.

14. Genetic information for a breed of chicken is shown below. 14. _____

Frizzle Fowl 

Types of Chickens with Different Feathers	
Genotype	**Phenotype**
FF	Normal (Normal feathers)
Ff	Frizzle fowl (Curly feathers)
ff	Feather shedder (Loses feathers easily)

Which of the following crosses of chickens will produce *only* Frizzle fowl offspring?

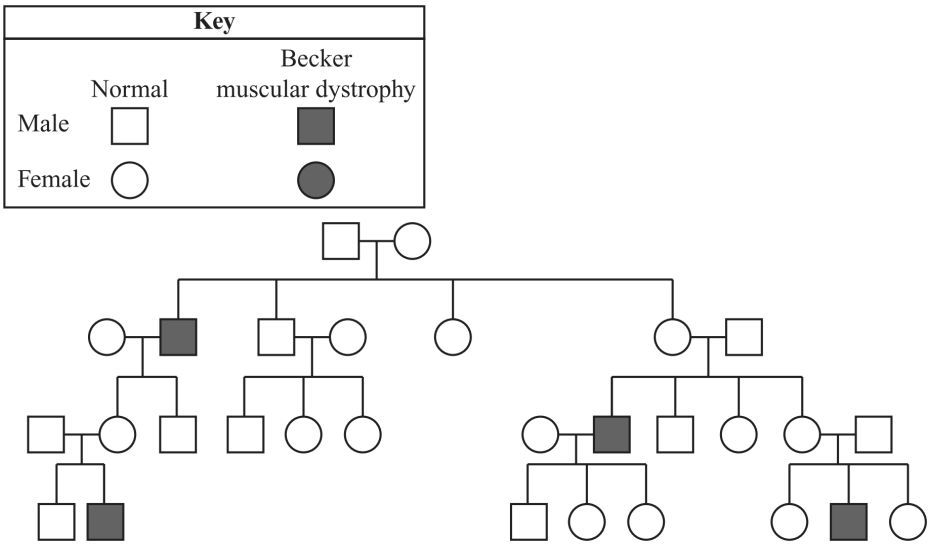
A. Normal × Frizzle fowl

B. Frizzle fowl × Frizzle fowl

C. Normal × Feather shedder

D. Feather shedder × Feather shedder

15. The pedigree below shows the occurrence of Becker muscular dystrophy in a family. Becker muscular dystrophy causes muscle weakness. 15. _____



Based on this pedigree, it is *most* reasonable to conclude that Becker muscular dystrophy is which of the following?

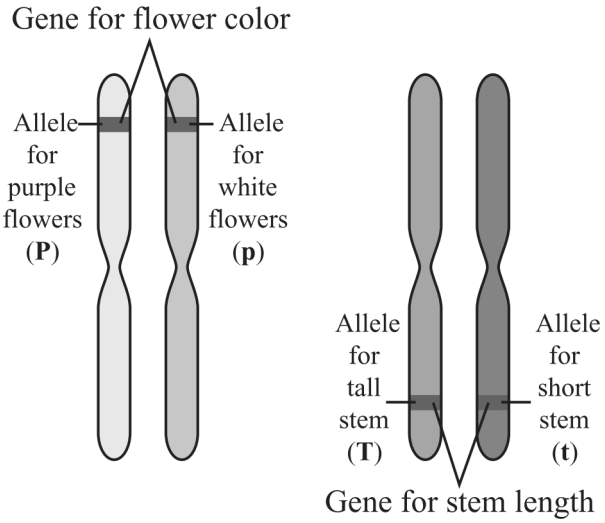
A. a polygenic trait

B. a codominant trait

C. a sex-linked recessive trait

D. an autosomal dominant trait

16. The diagram below shows the positions of the genes for flower color and stem length in a pea plant. The chromosomes represented below will replicate before meiosis. 16. _____



For these two genes, what is the maximum number of different allele combinations that can be formed normally in gametes produced from this cell?

A. 2 B. 4 C. 6 D. 8

17. Which of the following terms applies to traits, such as human eye color, that are controlled by more than one gene? 17. _____

A. codominant B. polygenic C. recessive D. sex-linked

18. In sheep, the allele for white wool (**W**) is dominant, and the allele for black wool (**w**) is recessive. A farmer has mated two Suffolk sheep for a few years. These matings have resulted in six offspring, four with white wool and two with black wool. One parent has white wool and the other has black wool. 18. _____

Which of the following could be the genotypes of the parent sheep?

A. **WW** and **Ww** B. **WW** and **ww** C. **Ww** and **Ww** D. **Ww** and **ww**

19. In pea plants, the genes for seed color and seed shape are on different chromosomes. Which of the following explains why the genes for these traits are not inherited together? 19. _____

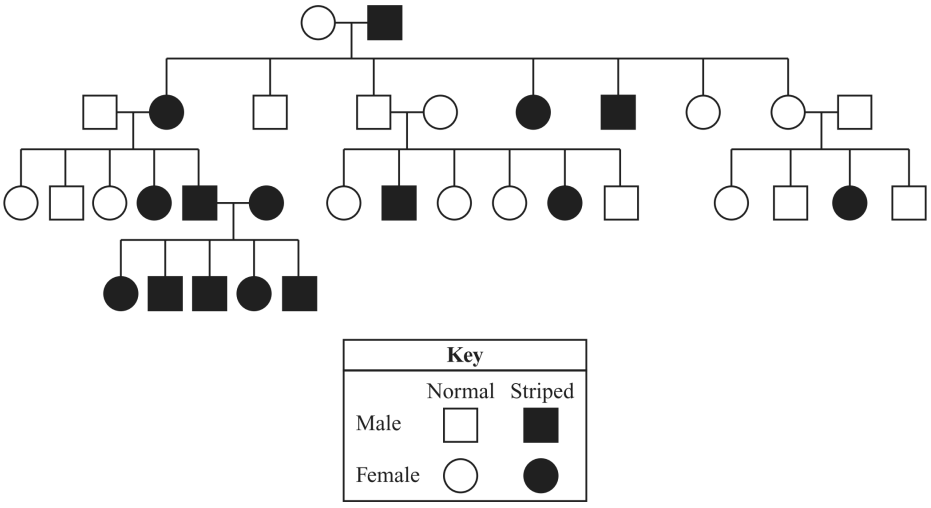
A. natural selection
B. artificial selection
C. the law of segregation
D. the law of independent assortment

20. A gene in horses controls whether the horse has a white coat or a colored coat. A white female horse and a white male horse are the parents of a total of five female offspring. Three of these offspring have white coats. The other two offspring have colored coats. 20. _____

The phenotypes of the horses suggest which of the following as the *most likely* pattern of inheritance for coat color?

A. The allele for a white coat is dominant.
B. The allele for a white coat is recessive.
C. The allele for a white coat is sex-linked.
D. The allele for a white coat is codominant.

21. A pedigree showing the inheritance of a gold dorsal stripe pattern in ball pythons is shown below. 21. _____



According to the pedigree, what type of trait is this stripe pattern in ball pythons?

A. codominant B. polygenic C. recessive D. sex-linked

22. In rabbits, a single gene controlling coat color has four alleles. The inheritance pattern for coat color in rabbits is therefore *best* described as which of the following? 22. _____

A. multiple allele B. polygenic C. recessive D. sex-linked

23. In fruit flies, the gene for eye color is located on the X chromosome, and the red eye allele (**R**) is dominant to the white eye allele (**r**). A female fly with genotype X^RX^r is mated with a male fly with genotype X^rY. 23. _____

Which of the following statements best describes the expected outcome of the cross?

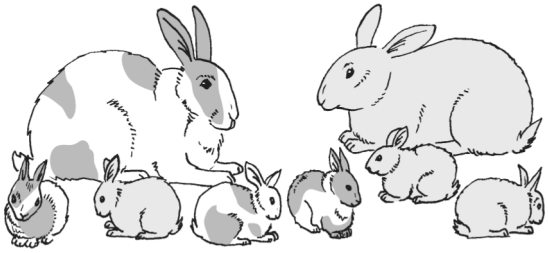
A. The chance of an offspring having red eyes is 75%.

B. The chance of an offspring having white eyes is 50%.

C. The chance that a male offspring will have white eyes is 0%.

D. The chance that a female offspring will have red eyes is 100%.

24. The illustration below shows two adult rabbits and their offspring. 24. _____



In rabbits, the allele for spots (**R**) is dominant to the allele for solid color (**r**). What is the *most likely* genotype of the parent rabbits in the illustration?

A. **rr** × **rr** B. **Rr** × **rr** C. **Rr** × **Rr** D. **RR** × **rr**

25. Hemophilia is an X-linked recessive condition in which blood does not clot properly. Queen Victoria of England had one allele for hemophilia. 25. _____

Which of the following statements describes the *most likely* pattern for the occurrence of hemophilia in Queen Victoria's descendants?

A. All of Queen Victoria's children had hemophilia.

B. All of Queen Victoria's children were carriers for hemophilia.

C. Female descendants of Queen Victoria could not pass on the gene for hemophilia.

D. More male descendants than female descendants of Queen Victoria had hemophilia.

26. Most sex-linked, recessive traits— including hemophilia and color blindness—appear in males. This phenomenon is *best* explained by which statement? 26. _____

A. Males have an X chromosome with dominant genes.

B. Most of the genes on the X and Y chromosomes of males are recessive.

C. In males, the recessive sex-linked genes appear only on the Y chromosome.

D. In males, the Y chromosome lacks the genes needed to mask the recessive genes on the X chromosome.

27. Huntington's disease is a dominant trait. What are the chances that a child will develop Huntington's disease if one parent is heterozygous and the other is normal? 27. _____

A. 0 out of 4 B. 1 out of 4 C. 2 out of 4 D. 3 out of 4

28. A karyotype of a human female shows that she has only one sex chromosome. Which genotype would represent her genetic condition? 28. _____

A. XO B. XXX C. XY D. XYY

29. Which set of parents can *most likely* produce a child with type O blood? 29. _____

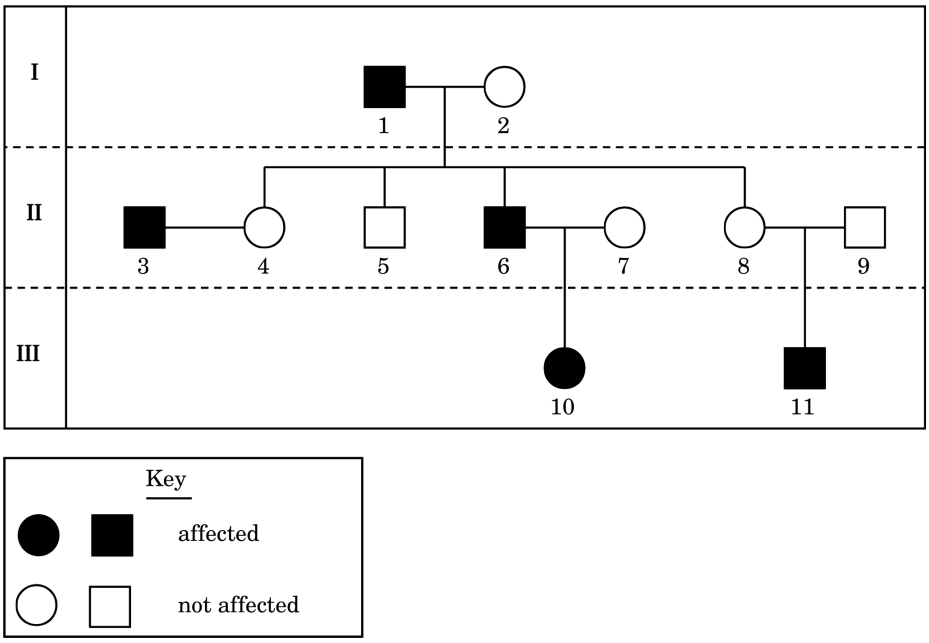
A. one parent with type AB blood, and the other parent with type A blood

B. one parent with type AB blood, and the other parent with type O blood

C. one parent with heterozygous type A blood, and the other parent with type O blood

D. one parent with homozygous type A blood, and the other parent with homozygous type B blood

30. This diagram shows a pedigree for a recessive genetic disorder. 30. _____



What is the genotype of individual 6?

A. X^HX^H B. X^HX^h C. X^HY D. X^hY