Name _____ Date _____

Non-Mendelian Inheritance Unit Review: Incomplete Dominance, Codominance, Multiple Alleles and Sex-Linked Traits

Directions: Answer each question about inheritance patterns that go beyond simple dominance, including incomplete dominance, codominance, multiple alleles and sex-linked inheritance. The last group of questions uses a table of results from a fruit fly cross.

1. Complete these sentences about human sex chromosomes with words from the bank.

Word bank
X-linked • dominant • recessive • Y • autosomal

Most human females have two X chromosomes, and most human males have one X chromosome and one _____ chromosome. A gene carried on the X chromosome is described as _____, while a gene on any of the other 22 pairs of human chromosomes is _____.

2. Match each description to the inheritance pattern it shows.

Write the letter of the matching answer on each line.

1. _____ In Shorthorn cattle, a red bull and a white cow have a roan calf with both red hairs and white hairs.
2. _____ In humans, red-green color blindness is usually caused by alleles carried on the X chromosome.
3. _____ A red snapdragon crossed with a white snapdragon gives only pink-flowered offspring.
4. _____ In rabbits, the C gene, one of the genes that affects coat color, has four different alleles, though each rabbit carries only two copies of it.

Choices for question 2

A. Sex-linked inheritance
B. Codominance
C. Multiple alleles
D. Complete dominance
E. Incomplete dominance

3. In snapdragons, the allele CˆR gives red flowers and the allele CˆW gives white flowers, and heterozygous CˆR CˆW plants have pink flowers. What ratio of flower colors is expected among the offspring of two pink snapdragons?

A. 1 pink : 2 red : 1 white
B. 3 pink : 1 white
C. All pink
D. 1 red : 2 pink : 1 white

4. In humans, ABO blood type is controlled mainly by one gene with three main alleles: IˆA, IˆB and i. A person with genotype IˆA IˆB has type AB blood. Why is this person's blood type AB rather than A or B?

A. The two alleles take turns being expressed, so the red blood cells switch between A and B markers.
B. The two alleles join to form one new allele, which puts a single AB marker on the red blood cells.
C. The two alleles are codominant, so the red blood cells carry both an A marker and a B marker.
D. The two alleles show incomplete dominance, so the red blood cells carry one in-between marker.

5. In the human ABO blood group system, which two genotypes give type B blood?

☐ A. IˆA i
☐ B. IˆA IˆB
☐ C. IˆB IˆB
☐ D. ii
☐ E. IˆB i

6. In the human ABO blood group system, a mother with genotype IˆA IˆB and a father with genotype ii have a child. Which blood types are possible for their child?

A. Any of the four types, A, B, AB or O
B. Either type AB or type O
C. Type O and no other type
D. Either type A or type B

7. How many different genotypes can the three main ABO alleles form when each person carries two of them?

A. 3 genotypes B. 9 genotypes C. 4 genotypes D. 6 genotypes

8. In humans, red-green color blindness is usually inherited as an X-linked recessive trait, and most males have one X and one Y chromosome, while most females have two X chromosomes. Why does this trait show up more often in males than in females?

A. A male has two X chromosomes, which doubles his chances of inheriting the color-blindness allele.

B. A male needs only one copy of the allele to show the trait, but a female needs two.

C. The allele is carried on the Y chromosome, which only males have.

D. Females cannot inherit the allele from their fathers, only from their mothers.

9. For red-green color blindness in humans, XˆB is the allele for normal color vision and Xˆb is the recessive allele for color blindness. A woman who inherited the trait has the genotype Xˆb Xˆb. Which statement about her parents is most likely true?

A. Her father has normal color vision, and her mother has two color-blindness alleles.

B. Her mother must be color-blind herself, and her father may have normal color vision.

C. Her father is color-blind, and her mother carries at least one color-blindness allele.

D. Neither parent carries the allele, since the trait skipped a generation to reach her.

10. Human height varies smoothly across a wide range, from very short to very tall, instead of falling into a few separate classes. Which explanation fits this pattern?

A. Height is shaped by many genes acting together, along with factors such as nutrition.

B. Height depends only on nutrition, and genes have no effect on it.

C. Height is controlled by a gene on the Y chromosome, so it varies only in males.

D. Height is controlled by a single gene, with one allele for tall and one allele for short.

An X-Linked Cross in Fruit Flies

In fruit flies, a gene on the X chromosome has an allele for red eyes (XˆR), which is dominant to an allele for white eyes (Xˆr). Female fruit flies are usually XX, and males are usually XY. In a cross, a red-eyed female known to be heterozygous, XˆR Xˆr, was crossed with a red-eyed male, XˆR Y, and all 404 offspring were counted.

Offspring of a red-eyed female fruit fly (XˆR Xˆr) and a red-eyed male (XˆR Y), sorted by sex and eye color

Offspring	Number with red eyes	Number with white eyes
Females	204	0
Males	98	102

11. About what percent of the male offspring in the table had white eyes?

A. About 50 percent B. About 25 percent C. About 75 percent D. 0 percent

12. In this cross, why did white eyes appear in sons but not in daughters?

A. Daughters cannot inherit a white-eye allele from either one of their two parents.

B. The white-eye allele is carried on the Y chromosome, which only the sons in this cross receive from their father.

C. Each daughter got her father's red-eye allele, while each son's only X chromosome came from his mother.

D. Sons have two X chromosomes, so they show X-linked traits more easily than daughters do.

13. Suppose a white-eyed male fruit fly (Xˆr Y) is crossed with a red-eyed female that carries no Xˆr (XˆR XˆR). Which offspring would most likely result?

A. All daughters red-eyed and carrying no white-eye allele, and all sons white-eyed

B. About half of the daughters white-eyed like their father, and all sons red-eyed

C. All daughters red-eyed, and about half of the sons white-eyed like their father

D. All offspring red-eyed, with every daughter carrying the white-eye allele