Name _____ Date _____

Inherited Traits and Punnett Squares with Fruit Flies

Directions: Read the passage and study both tables. Then answer each question.

Flies With Two Kinds of Wings

Most fruit flies have long, flat wings that carry them from one ripe banana to the next, but a few have short, crumpled wings, called vestigial wings, and can only walk.

This wing difference comes from a single gene with two alleles. In this activity, V stands for the allele for normal wings and v stands for the allele for vestigial wings. Because V is dominant, a fly with even one V allele has normal wings, and only a vv fly has vestigial wings.

Each fly inherits one allele for this gene from each parent, and which of its two alleles a parent passes on is a matter of chance, like a coin toss. A Punnett square shows every combination of alleles the parents could pass on. Because each box is equally likely, a Punnett square gives the chance for each offspring, not an exact count.

A class set up two crosses in separate vials. In cross 1, both parent flies were Vv, and in cross 2, one parent was Vv while the other was vv. The class knew each normal-winged parent was Vv because one of its own parents had vestigial wings. Both vials held the same kind of fly food and sat in the same warm spot in the classroom. About two weeks later, after the young flies had developed into adults, the class counted the offspring in each vial by wing type.

Punnett square for cross 1 (Vv × Vv): parent 1's alleles are across the top, and parent 2's alleles are down the left side

Parent 2's allele	**Parent 1 passes on V**	**Parent 1 passes on v**
Parent 2 passes on V	VV	Vv
Parent 2 passes on v	Vv	vv

Offspring counted in each vial

Cross	**Parent genotypes**	**Normal-winged offspring (number)**	**Vestigial-winged offspring (number)**
1	Vv × Vv	94	26
2	Vv × vv	58	62

1. Based on the Punnett square for cross 1, what is the chance that any one offspring has vestigial wings?

A. No chance at all B. 1 in 2 C. 3 in 4 D. 1 in 4

2. Which genotypes in the Punnett square give a fly normal wings?

A. Vv only B. VV only C. VV and Vv D. Vv and vv

3. Based on the Punnett square, how many of the 120 offspring in cross 1 would you expect to have vestigial wings, on average?

_____ flies

4. How did the number of vestigial-winged offspring the class counted in cross 1 compare with the number expected from the Punnett square?

A. The class counted a few more than expected.

B. The class counted less than half the number expected.

C. The class counted exactly the number expected.

D. The class counted a few fewer than expected.

5. What is one reason the counts in a real vial can differ from the numbers a Punnett square leads you to expect?

A. Recessive traits always show up less often than predicted, because recessive alleles are weaker.

B. Some vestigial-winged flies grew normal wings because they needed to fly to reach food.

C. A Punnett square works for pea plants, but flies do not pass on alleles by chance.

D. Each offspring's alleles depend on chance, so real counts usually land near the expected numbers, not right on them.

6. Which part of the setup differed between the two vials?

A. The spot where each vial was kept

B. The kind of fly food in each vial

C. The genotypes of the parent flies

D. The wing types of the offspring

7. Each offspring in cross 2 (Vv × vv) gets one allele from each parent. What chance does each offspring have of being vv, with vestigial wings?

A. 1 in 2

B. 1 in 4

C. 3 in 4

D. No chance at all

8. Based on the wing counts from the two vials, which claim is supported?

A. In these two vials, the share of offspring with vestigial wings came close to the chance a Punnett square gives for each cross.

B. In every vial of Vv × Vv flies, the offspring will match the Punnett square's prediction exactly.

C. In these two vials, vestigial wings showed up less often because the v allele is weaker than the V allele.

D. In cross 2, the v allele became dominant, since more offspring had vestigial wings than normal wings.

9. The passage says the class knew each normal-winged parent was Vv because one of its own parents had vestigial wings. Why does that show it was Vv?

A. Every normal-winged fly has one V allele and one v allele, so it must be Vv.

B. A vestigial-winged fly is Vv, so it passes on V to about half of its offspring.

C. A vestigial-winged fly is vv and can pass on only v, so its normal-winged offspring got one v and one V.

D. A fly's wing type always matches the wing type of its grandparents.