

Key

Name _____

1. Coat color in cats is located on the X chromosome. It is controlled by a single gene with just two alleles. Cats can be black, yellow, or calico. A calico cat has black and yellow splotches. A female calico cat is crossed with a male black cat. What are the phenotypes of the offspring and in what proportion?



$B = \text{black}, L = \text{yellow}$

♀ = 50% black & 50% calico

♂ = 50% black & 50% yellow

2. In fruit flies gray body is dominant to black body and normal wings are dominant to vestigial wings. Flies heterozygous for both gray bodies and normal wings were crossed with flies that had black bodies and vestigial wings. The following results were obtained:

Phenotype	Number of flies
Gray body/normal wings	482
Black body/vestigial wings	472
Black body/vestigial wings	103
Black body/normal wings	92

The results indicate that the genes for wings and body color are on the same chromosome. The recombinant offspring are a result of crossing over. How many map units (expressed as a percent) apart are the two genes? (The formula for calculating recombination frequency is:

Recombination Frequency = number of recombinants / total number of offspring x 100

$$\frac{195}{1149} = 0.1697 = \sim 17\%$$

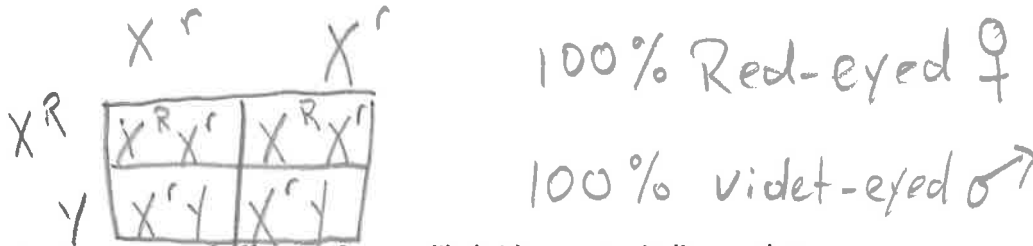
3. Given the following recombination frequencies, what is the correct order of the genes on the chromosome? A-B, 8 map units; A-C, 28 map units; A-D, 25 map units; B-C, 20 map units; B-D 33 map units.

D A B C

or

C B A D

4. A cross of a wild-type red-eyed female *Drosophila* with a violet-eyed male produces all red-eyed offspring. If the gene is X-linked, what should the reciprocal cross (violet-eyed female x red-eyed male) produce? Assume that the red allele is dominant to the violet allele.



5. A 1:1:1:1 ratio of offspring from a dihybrid testcross indicates that

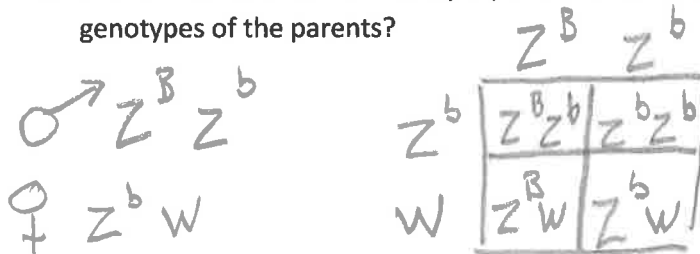
- a. The genes are linked.
- b. The dominant organism was homozygous
- c. Crossing over has occurred the genes are 25 map units apart.
- d. The genes are not linked or are more than 50 map units apart.

6. A dominant sex-linked allele B produces white bars on black chickens. A clutch of chicks has equal numbers of black and barred chicks (Sex is determined by the Z-W system in birds: ZZ are males, ZW are females.)

- a. If only the females are found to be black, what were the genotypes of the parents?



- b. If males and females are evenly represented in the black and barred chicks, what are the genotypes of the parents?



7. Given the following recombination frequencies, what is the correct order of the genes on the chromosome? A-C: 13, C-D: 13, D-B: 5, A-B: 31

A C D B
or
B D C A