

AP Biology Genetics Worksheet

Creating a Linkage Map of a Chromosome

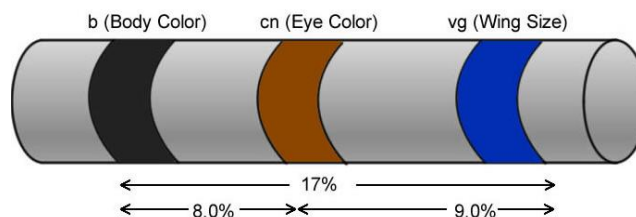
Recombination

Genes on chromosomes switch places during crossing over which occurs during Prophase I of Meiosis. Crossover is random, but the likelihood that 2 genes crossover will increase if those genes are farther apart. Genes closer together are more likely to "stick together" and not switch places. These genes are said to be **linked**.

Gene Linkage Maps

Using the crossover frequencies, you can construct a map to represent the distances between genes.

This map shows chromosome #2 of *Drosophila melanogaster*. The distance between the genes can be written as a percentage or as a MAP UNIT. The gene for body color and wing size are 17 map units apart.



Sample Problem

Given the crossover frequency of each of the genes on the chart, construct a chromosome map.

Gene	Frequency of Crossover
A-C	30%
B-C	45%
B-D	40%
A-D	25%

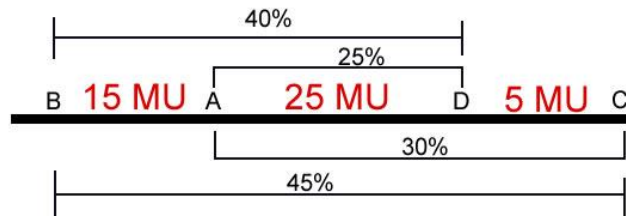
Step 1: Start with the genes that are the farthest apart first: B and C are 45 map units apart and would be placed far apart.

B ----- 45% ----- C

Step 2: Solve it like a puzzle, using a pencil to determine the positions of the other genes.



Step 3: Subtraction will be necessary to determine the final distances between each gene.



Practice Problems

1. In *Drosophila*, bar shaped eyes (B), scalloped wings (S), crossvein-less wings (W), and eye Color (C) are located on the X chromosome. The recombination frequency of each gene is indicated on the table. Construct a chromosome map.

Gene	Frequency of Crossover
W-B	2.5%
W-C	3.0%
B-C	5.5%
B-S	5.5%
W-S	8.0%
C-S	11.0%

2. The following chart shows the crossover frequencies for genes on an autosome of the Armor Plated Squirtlesaur. Construct a chromosome map.

Gene	Frequency of Crossover
P-Q	5%
P-R	8%
P-S	12%
Q-R	13%
Q-S	17%



3. Construct a map given the following data.

Gene	Frequency of Crossover
A-B	24%
A-C	8%
C-D	2%
A-F	16%
F-B	8%
D-F	6%