

**LINKED GENES PROBLEMS**

Name \_\_\_\_\_

1) In *Drosophila melanogaster* (fruit flies), gray body and red eyes are wild-type, while black body and purple eyes are mutants. Below is a list of the offspring resulting from the mating of a wild-type fruit fly (heterozygous for gray body color and red eyes) with a black fruit fly with purple eyes.

- 721 - wild type
- 751 - black-purple
- 49 - gray-purple
- 45 - black-red

a) Are the two genes linked, and if so how far apart are they? \_\_\_\_\_

2) Determine the sequence of genes along a chromosome based on the following recombination frequencies. Place the genes on the chromosome (line) below.

- A-B = 8%
- A-C = 28%
- A-D = 25%
- B-C = 20%
- B-D = 33%



3) Assume genes F and G are linked and are 50 map units apart. An individual heterozygous at both loci is crossed with an individual who is homozygous recessive at both loci.

a) What percentage of the offspring will show phenotypes resulting from crossovers? \_\_\_\_\_

b) If you did not know that genes F and G were linked, how would you interpret the results of this cross?

4) Work through #6 (and a modified version of #7) from page 244 of the textbook. Show your work.

#6)

#7) In *Drosophila melanogaster* (fruit flies), normal wings and red eyes are wild-type, while vestigial wings (short wings) and purple eyes are mutants. Below is a list of the offspring resulting from the mating of a wild-type fruit fly (heterozygous for normal wings and red eyes) with a black fruit fly with purple eyes.

- 224 - wild type
- 240 - black-purple
- 90 - normal wings-purple
- 86 - black-red

Are the two genes linked, and if so how far apart are they? \_\_\_\_\_

5) A space probe discovers a planet inhabited by creatures who reproduce with the same hereditary patterns as those in humans. Three phenotypic characters are height (T = tall, t = dwarf), head appendages (A = antennae, a = no antennae), and nose morphology (S = upturned snout, s = downturned snout). Since the creatures were not “intelligent,” the Earth scientists were able to do some controlled breeding experiments using various heterozygotes in testcrosses. Listed below are the results from each test cross with following heterozygous parent.

<u>Phenotype of parent</u>	<u>Phenotype and number of offspring</u>
i) Tall - Antennae (TtAa)	Tall - Antennae - 32
	dwarf - Antennae - 19
	dwarf - no antennae - 28
	Tall - no antennae - 21
ii) Antennae - Upturned snout (AaSs)	Antennae - Upturned - 36
	no antennae - Upturned - 14
	no antennae - downturned - 34
	Antennae - downturned - 16
iii) Tall - Upturned snout (TtSs)	Tall - Upturned - 44
	dwarf - Upturned - 6
	dwarf - downturned - 46
	Tall - downturned - 4

a) Calculate the recombination frequency for the following genes.

TA = \_\_\_\_\_ AS = \_\_\_\_\_ TS = \_\_\_\_\_

b) Use your answers from (a) to determine the correct sequence of the three linked genes and show their relative distance from one another.



c) If a creature that is pure breeding and dominant for all three traits (AATTSS) is crossed with a pure breeding recessive (aattss) for all three traits, what is the genotype of their offspring (F<sub>1</sub>)?

\_\_\_\_\_

d) What would be the probability of the F<sub>1</sub> from (c) producing the following gametes?

1) ATS - \_\_\_\_\_

3) aTs - \_\_\_\_\_

2) Ats - \_\_\_\_\_

4) AtS - \_\_\_\_\_