

1. Wild-type (N for normal) fruit flies are mutagenized with X-rays then bred to homozygous recessive flies, the F1s have a variety of phenotypes. Those F1s are in turn bred back to homozygous recessive flies and the phenotypes of those offspring noted. Each original mutant was named M#.

Phenotype of F1 flies  
from

N ABDQ  
M1 ABDQ  
M2 aBdQ  
M3 ABDQ

Test-crossed

F1 from	N	M1	M2	M3
% recombinants				
A → B	10	1	na	10
A → D	15	0	na	49
A → Q	20	3	na	52
B → D	25	1	na	51
B → Q	30	4	6	48
D → Q	5	3	na	5
% viable eggs	98	12	94	32

na means not applicable due to the phenotype of the F1

a) Draw a map of the genes for normal flies

b) Draw a map and explain the mutation for

M1

M2

M3

2. The genes necessary to synthesize leucine, methionine, and threonine, are close together enough on the bacterial genome for conjugation. You use a  $leu^+$ ,  $met^+$ ,  $thr^+$  Hfr donor to "mate" with a  $leu^-$ ,  $met^-$ ,  $thr^-$  recipient. You select for recombinants on 3 different growth mediums. Each medium lacks either leucine or methionine or threonine. You then check the colonies on each plate to determine what gene combination they have. These are your results (# of colonies with indicated genotype):

Medium	minus leu	minus met	minus thr
colony genotype			
$leu^+met^+thr^+$	2328	2334	2325
$leu^+met^+thr^-$	400	400	0
$leu^+met^-thr^+$	245	0	122
$leu^+met^-thr^-$	150	0	0
$leu^-met^+thr^+$	0	2	3
$leu^-met^+thr^-$	0	1270	0
$leu^-met^-thr^+$	0	0	48
$leu^-met^-thr^-$	0	0	0

a) What is the gene order of the 3 genes, starting from the first gene to enter?

b) To calculate map unit distances you should use the numbers which medium?

c) draw a map of the three genes showing map units.

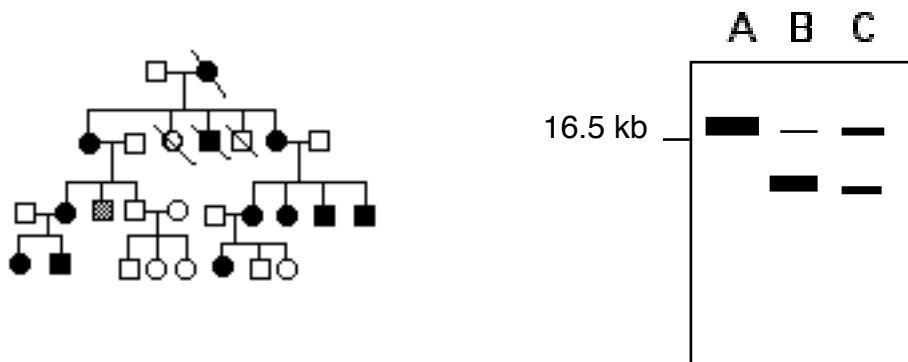
3. A chlorophyll mutation causing a very dark green leaves is found in chloroplast DNA in a type of petunia. A recessive nuclear mutation causes red speckled flowers. If you pollinate a red speckled flower on a dark green plant with pollen from an normal flower on a normal light green plant, what fraction of the F2 offspring would you expect to have dark green leaves and red speckled flowers?

Due April 8, beginning of class

staple

4. You see a 62 year old woman (Ruth) in your family practice initially thought to have some senile dementia but who has now developed serious problems with muscle weakness. In speaking to her husband (Ralph) you find out that her mother had the same thing. Her oldest sister (Mae) has been hospitalized in a local nursing home for some time and exhibits some unusual weakness and one of her older brothers died after having the same. Her other two siblings died a number of years ago. Ralph does not remember them having any similar mental or muscle problems. Ralph is very concerned though because all of their children have complained about problems with weakness and their oldest grandchild is currently undergoing tests for a possible muscular dystrophy. On top of that Ruth's 53 year old niece has been hospitalized, her older nephew has been acting oddly, and her niece's 2 adult children have been tentatively diagnosed with a muscular dystrophy.

You draw a pedigree of the family (below) and obtain DNA samples from Ralph and Ruth and Mae. You have your technician do a Southern blot and get the following results. Unfortunately your technician failed to label which samples she ran in which lane.



a) How do you explain this inheritance pattern?

b) Your technician re-runs the gel and does another Southern blot and tells you which lane was which person. Which sample do you think was

Ruth

Ralph

Mae

and what was your probe for the Southern blot?