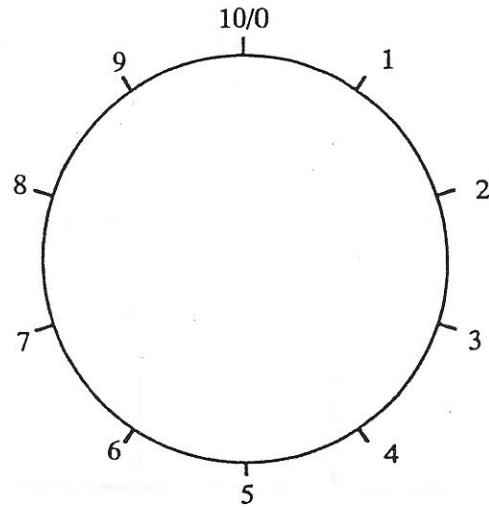
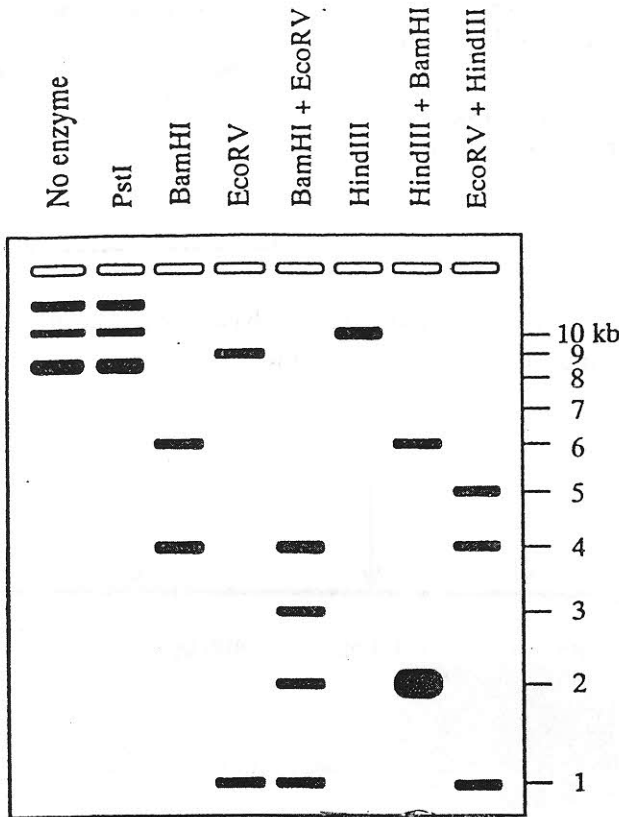


Quiz will consist of 2 MC, 1 "grid in" math problem, 1 FRQ

1. Plasmid Problem

If you can survive this one, anything you might see on the quiz will be easy!

A plasmid was isolated from *E. coli* and analyzed on an agarose gel after cutting the DNA with various restriction enzymes. A representation of the agarose gel is shown on the left.



- a. True/False: Answer these questions about the results shown on the gel.
- All of the DNA molecules on this gel are linear.
 - Because they have moved different distances in the gel, the bands in lanes 1 and 2 must have different lengths.
 - Large linear DNA fragments move faster than small linear fragments.
 - Lane 1 serves as the control for lane 2.
 - There is no site for PstI cleavage in this plasmid.
 - BamHI cleaves the plasmid twice.
 - EcoRV cleaves the plasmid once.
 - HindIII cleaves the plasmid once.
 - The fat 2 kb band in lane 7 contains twice as much DNA as the 2 kb band in lane 5.
 - The sum of the fragment lengths for each of the digest shown in lanes 3 through 8 is 10 kb.

b. Make a restriction map of this plasmid.

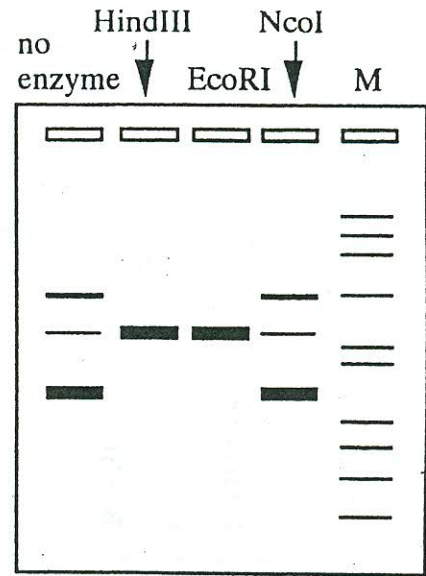
2. In fruit flies, there is a dominant gene for gray body color and another dominant gene for normal wings. The recessive alleles for these 2 genes result in black body color and vestigial wings respectively. Flies homozygous dominant were crossed with flies that were homozygous recessive. The offspring were then test-crossed, with the following results.

Gray body, normal wings	236
Black body, vestigial wings	253
Gray body, vestigial wings	50
Black body, normal wings	61

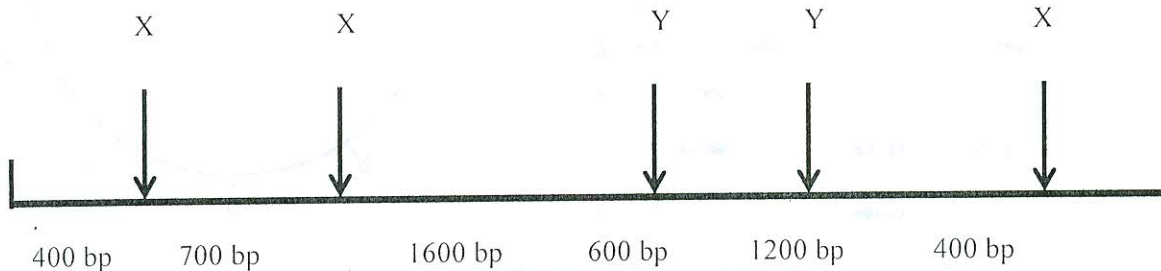
Are these genes linked? If so, how far apart are they? _____

3. The circular plasmid that you isolated from *E. coli* in lab was cut with several different restriction enzymes and run on a gel with DNA size markers, "M". The gel is shown at the right.

- How many *Hind*III sites are there in the plasmid?
- How many *Eco*RI sites are there in the plasmid?
- How many *Nco*I sites are there in the plasmid?
- What additional experiment would you need to do to make a map of the plasmid that includes both *Eco*RI and *Hind*III sites?
- If you were given the sizes of the DNA markers, what would you plot to determine the size of this plasmid?



4. The diagram below shows a segment of DNA with a total length of 4,900 base pairs. The arrows indicate reaction sites for two restriction enzymes (enzyme X and enzyme Y).



- Explain how the principles of gel electrophoresis allow for the separation of DNA fragments.
- Describe the results you would expect from the electrophoresis separation if fragments from the following treatments of the DNA segment above. Assume that the digestions occurred under appropriate conditions and went to completion.
 - DNA digested with only enzyme X
 - DNA digested with only enzyme Y
 - DNA digested with enzyme X and enzyme Y combined
 - Undigested DNA
- Explain both of the following.
 - The mechanism of action of restriction enzymes.
 - The different results you would expect if a mutation occurred at the recognition site for enzyme Y.