

DNA electrophoresis, Complementation, and GMB II Pre-lab. **Due at the start of lab.**

Name \_\_\_\_\_ GSI & Sect # \_\_\_\_\_ Station # \_\_\_\_\_

To answer these questions read all of the lab material on constructing recombinant DNA (pages 64-90) even though you are only doing pages 85-88 for lab 6. You also need to read about complementation (pages 111-118) even though you are only doing pages 116-118. You also need to read about GMB II (pages 145-158). Write legibly. You will NOT be admitted to lab unless you turn in this completed pre-lab at the start!

Please write your answers **neatly & legibly**. **NOTE WELL:** You will not be admitted to your lab unless you turn in this completed pre-lab at the **beginning** of your lab! The genetics portion is typically very difficult for many students. Your instructor(s) will review the material in lab and lecture.

1) Define the following terms:

autosomal chromosomes

sex chromosomes

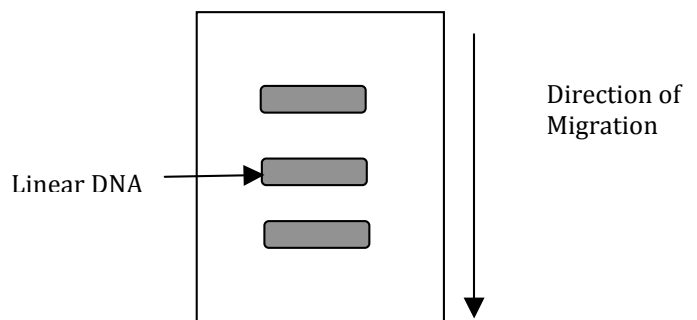
genetically linked genes

X-linked genes

2) Name two purposes of the loading dye?

3) Migration of DNA in an agarose gel varies depending upon the size and conformation of the DNA. A mixture of three DNA conformations, all having a size of 4,500 base pairs, was loaded into a well and the sample was electrophoresed. The banding pattern of the DNA is shown below. Note that the band that corresponds to linear DNA is labeled. Indicate which of the other two bands correspond to the supercoiled and the relaxed (nicked) DNA.

- a) supercoiled DNA, size 4,500 base pairs
- b) linear DNA, size = 4,500 base pairs
- c) relaxed (nicked) DNA, size = 4,500 base pairs



4) What is the phenotype and sexes of the flies used in the Parental cross?

**Pre-lab continued on the other side.**

5) Write the **genotype** for the following two fruit flies involved in a cross. Use proper genetic notation. The female fly is heterozygous for dumpy antennae, a recessive trait and homozygous for knob foot, a dominant trait (note: the wild type alleles for antennae and foot are normal antennae shape and normal foot shape). The male fly is heterozygous for dumpy antennae and hemizygous for normal foot. The dumpy antennae locus is located on chromosome # 3 (an autosome) and the knob foot locus is located on the X chromosome (a sex chromosome).

Use the letters da for dumpy antennae and kf for knob foot. You must determine if they should be upper or lower case. To determine this you must determine if the mutation is recessive or dominant? **Complete a Punnett square for the cross between the female and male. You must include the genotype of the offspring.**

Genetic Notation for : male:

female:

Female gametes (across the axis, in bold)

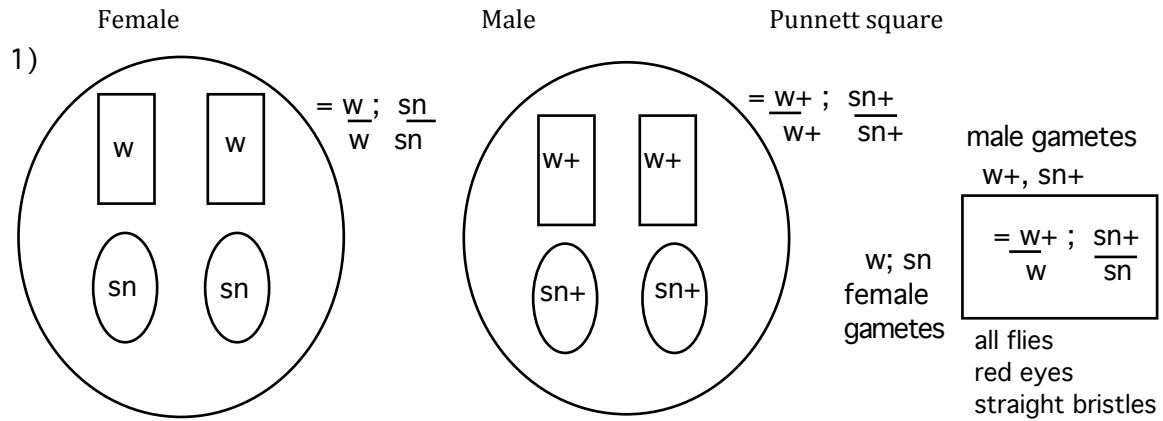
Male				
Gametes				

6) In lab you will examine 2 phenotypes---eye color and bristle shape. Fruit flies will have either red or white eyes (alternative forms of eye color), and straight or singed bristles (alternative forms of bristle shape). Assume, for purposes of this worksheet, the mutations, white eye and singed bristles are recessive (mutations need not be recessive).

Notation: w = white eyes, w<sup>+</sup> = red eyes; ) sn = singed bristles, sn<sup>+</sup> = straight bristles: (note use of lower case, superscript with + to indicate wild type

These alleles are distributed on chromosomes. Keep in mind that there are two types of chromosomes: autosomal and sex chromosomes. For the following cross please show, with pictures and notation, the 5 possible ways these alleles could be distributed on chromosomes. Do not place the alleles on the Y chromosome – only X or autosomal. The female came from a pure breeding stock with white eyes, singed bristles. The male came from a true breeding stock with red eyes, straight bristles. Construct Punnett squares for each, and make a prediction about the F<sub>1</sub> for each. You should indicate phenotype and the ratio for each type of offspring. Use the proper notation. One possibility has been illustrated. In this case the alleles are on different autosomes- one is drawn as a circle, the other as a rectangle. Clearly the two genetic loci are genetically unlinked because they are on different chromosomes. There are four more possibilities—i.e. other than both traits on different autosomes. (Do not place the loci on the same autosome but so far apart that they appear to be genetically unlinked because that was already done for you.) Consider which locus you put on which type of chromosome and also how far apart those loci are. One possibility is shown on the next page. You need to indicate four other possibilities.

**NOTATION IS CRITICAL. Make the connection between your drawing of the chromosomes with the loci indicated and how this is reflected in notation.**



Autosomally  
unlinked

2)

3)

4)

5)

# **Genetics and Molecular Biology II Notes**